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Editorial

Dear professional colleagues,

I bring you all greetings in the name of our Lord Jesus Christ. We thank God for the successful publication of the first issue of Volume One of the *Journal of Family and Society Research*. The journal is a publication of the Association for Family and Society Scientists. It is a multidisciplinary medium through which academics and other allied professionals showcase their research output to the world. It offers a credible outlet for all research outputs that border on issues affecting individuals, families and by extension, the wider society.

Journal of Family and Society Research is aimed at publishing articles with quality content and clear methodological procedures. Every article published here undergoes a series of reviews from our able editorial team who have a proven record of academic achievements in their various disciplines.

This second issue publication is proof that *JFSR* is moving forward. Feel free to always attend our annual international conferences and workshops as they promise to be very interactive and mind whetting. The journal has both print and online publications.

Note that papers are welcome all year round through the journal email jfsr.2022@gmail.com.

Thank you once again for being part of the good thing the Good Lord is doing through us and for us.

Best wishes,

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Assessment of Compassion Fatigue and Psychological Well-Being of Special Needs Children's Educators in Enugu State

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Abstract

The study was carried out to assess the level of compassion fatigue and psychological well-being of special needs educators. It adopted a cross-sectional survey design. The sample for the study was 416 special needs educators. The compassion fatigue subscale of the Professional Quality of Life scale (ProQOL) was used to assess compassion fatigue in the dimensions of burnout and secondary traumatic stress. Psychological well-being was measured using Ryff's Psychological Well-being scale in the dimensions of autonomy, environmental mastery, positive relationship with others, purpose in life, personal growth and self-acceptance. Frequency and percentage were used to analyze the descriptive data while Pearson's correlation was used to determine the relationship between variables. From the result, the majority (87.7%) of the respondents was females and 81.5% were between the age of 20-40 years. The majority (97.3%) of the respondents had moderate level compassion fatigue in both dimensions of burnout and secondary traumatic stress. About a quarter (24.7%) of the respondents reported a low level of psychological well-being. Psychological well-being dimensions of positive relationships with others and purpose in life were found to negatively correlate with secondary traumatic stress, while environmental mastery and purpose in life had a positive relationship with burnout among the special educators. Therefore, the study concludes that special needs educators experience compassion fatigue at a moderate level. The study recommends that there should be an increase in the social support rendered to special needs educators as this could encourage them more in executing their duties.

Keywords: Compassion, Compassion fatigue, Well-being, Psychological well-being, Special needs children

Introduction

Compassion is expressed as a motivation to act or to alleviate the suffering of other people (Sirin et al., 2015). It emanates from an inner desire to assist people to get out of pain and grief. Compassionate care providers

derive pleasure from being able to help people, and achieving this goal gives them a sense of achievement and success, known as compassion satisfaction (Pehlivan & Guner, 2018). However, when a care provider fails to see a significant improvement in the

condition of the person or people being cared for, there could be a gradual decrease in compassion over time leading to what is known as compassion fatigue (Sorenson et al., 2016).

Compassion fatigue according to the American Institute of Stress (2017) is the emotional stress that results from being exposed to victims of trauma. Figly (2002) referred to compassion fatigue as vicarious traumatization, secondary traumatization or the cost of caring for suffering individuals. It stems from giving high levels of energy and compassion over a prolonged period to those who are suffering, often without experiencing the positive outcomes of seeing them improve. It can be a result of a cumulative effect of caring for suffering persons over time or just one case of traumatized individuals (American Institute of Stress, 2020). Compassion fatigue is an occupational hazard, which means that almost everyone who cares about their work/clients will eventually develop a certain amount of it, to varying degrees of severity (Ontario Nurses' Association [ONA], 2006). Compassion fatigue occurs in two dimensions; burnout and secondary traumatic stress (STS). Burnout is a type of compassion fatigue that occurs due to exhaustion, frustration, anger and depression. It is a response to the emotional strain or job stress that arises from the social interaction between the helper and the help recipient. Secondary traumatic stress on the other hand is a negative feeling driven by fear and work-related trauma (Lee et al., 2021). It is usually experienced by individuals in the caring professions such as teachers, nurses and caregivers of elderly people. An

individual experiencing compassion fatigue develops a feeling of anxiety and shame as a result of feeling personally responsible for the sufferings of their clients. They tend to see themselves as rescuers who failed in their rescue mission; hence they may become worried or sad and might experience diminished well-being (Robinson, 2005).

An individual's feeling of well-being refers to an experience of health, happiness and prosperity (Davis, 2019). It includes having good mental health, high life satisfaction, a sense of meaning or purpose and the ability to manage stress. In addition, well-being is seen as the result of a dynamic process of constant interaction between individual, environmental, cultural and social factors (Umukoro & Egwakhe, 2019), as well as a desirable condition for groups, organizations, communities and society. Psychological well-being is defined as a dynamic state, in which the individual is able to develop their potential, work productively and creatively, build strong and positive relationships with others and contribute to their community (Slade, 2010). It also means active engagement with life activities, the effective functioning of an individual, the development of one's potential, and control of one's life with a purpose (Bargh & Morsella, 2008). Ryff, (1989) designed six theoretically motivated constructs of psychological well-being which are, autonomy, environmental mastery, personal growth, positive relationship with others, and self-acceptance. Autonomy implies that the respondent is self-sufficient and can control his or her conduct without relying on societal forces; environmental mastery is the

ability to make good use of chances to manage daily affairs and create settings that suit personal requirements; personal growth implies that the person is open to new experiences, and sees development in behaviour and self through time; positive relationship with others involves meaningful interaction with other people, in reciprocal empathy, tenderness, and affection; purpose in life indicate a strong personal goal orientation and belief that life has significance and self-acceptance indicates good attitude toward oneself (Van-Dierendonck et al., 2008).

Psychological well-being provides an individual with mental resources to carry out one's daily responsibilities at home, workplace and in society in general. Individuals in the helping profession such as nurses, counsellors, social workers and teachers are mostly predisposed to impaired psychological well-being as a result of working among distressed and health-challenged people (Zaki, 2016). Special teachers belong to the helping profession as they provide out-of-home care and education for children who have chronic physical, behavioural, developmental, or emotional impairments (Health Resources and Services Administration, 2021). This group of children requires special care and assistance to navigate through their daily activities much more than normal children of the same age. Special needs children include children with autism, down syndrome, dyslexia, blindness and cystic fibrosis (Lyons & Leon, 2010). They usually have problems with self-help, schoolwork, communication or behaviour, hence parents often enrol them in special schools where they are cared for and taught by specially

trained teachers. Special education teachers are tasked with the responsibility of managing children with multiple disabilities ranging from mild to profound (Emery & Vandenberg, 2010) and are often expected to be empathetic and compassionate when working with disabled pupils and their families (Nelson-Gardell & Harris, 2003). They are required to carry out these tasks often with limited support from the government, parents and school management. Thus, special needs children's teachers often find themselves overburdened and under-resourced to help their students and their student's families, who are experiencing difficult routines and extreme trauma. These combinations of disabilities often pose a heavy challenge for special education teachers concerning effective management of the children hence they are at a high risk of experiencing frustration, and helplessness resulting in burnout and or vicarious trauma. These in turn could impact their sense of psychological well-being.

A study conducted by Maytum et al. (2004) on work-related stress among social workers and nurses, found that unaddressed compassion fatigue may heighten the risk of burnout over time. Walrond et al. (2018) found a significant relationship between compassion fatigue and educator attrition. In a similar study, Abraham-Cook (2012) using the Professional Quality Life Scale (PROQOL), found that 91% of educators scored very low (24 points) on compassion fatigue. In a qualitative study of educators working at trauma-sensitive urban schools, Hill (2011)

found that teachers often experienced “distressing emotions, powerlessness, intrusive imagery, physiological arousal, somatic complaints, and constantly being on call.” However, Figley (2002b) observed that compassion fatigue is highly treatable if it is recognized and acknowledged early enough, and does not usually necessitate that an individual quit their work. Thus, it is on this premise that this study is based, to determine the level of compassion fatigue and its association with the psychological well-being of special needs educators in Enugu state, to provide an empirical basis for early intervention.

Objectives of the Study

The broad objective of the study was to assess the compassion fatigue and psychological well-being of special needs educators in Enugu state. The specific objectives of the study were to:

1. assess the level of compassion fatigue among special needs children’s educators in Enugu state;
2. assess the psychological well-being status of the respondents and
3. determine the relationship between compassion fatigue and the psychological well-being of special need children’s educators.

Methodology

Study design: The study adopted a cross-sectional survey design.

Population of the study: The study population comprised 146 teachers in the special needs schools in Enugu state. Enugu state has only three special needs schools namely Therapeutic school Abakpa Nike, School of the blind, deaf and dumb, Oji River, and School of autism Nsukka, Enugu State. The

teachers’ population in the three schools was 100, 30 and 16 teachers respectively.

Sample Size: All the one hundred and forty-six (146) staff of the special schools were used for the study since the population is manageable.

Ethical Clearance and Informed Consent: Ethical approval for the study was obtained from the University of Nigeria Teaching Hospital Ethical Committee on Research Projects with reference number

NHREC/05/01/2008B-FWA00002458-1RB00002323. An informed consent form was used to get the respondents’ consent to participate in the study. The content of the form was duly explained to the respondents before they signed.

Instruments for Data Collection: The compassion fatigue of the respondents was measured using two sub-scales of the Professional Quality Life Scale (ProQOL) Version 5. ProQOL is a 30-item self-report questionnaire which measures the positive and negative effects of working with people who are experiencing extremely stressful life. Only twenty (20) items of the ProQOL measuring compassion fatigue in the dimensions of burnout and secondary traumatic stress were used for this research work. The respondents rated how often they felt a particular way in the past 30 days. Items 1,4,8,10,15,17,19,21, 26 and 29 measured the dimension of burnout, while items 2,5,9,11,13,14,23,25 and 28 measured STS. Sample questions for burnout include “I am happy”, and “I feel connected to others”. Sample questions for STS include “I think I might have been affected by the traumatic stress of those I teach”. The items have a five-point

rating scale: 5=Very Often 4=Often, 3=sometimes, 2= Rarely, 1=Never.

The psychological well-being of the respondents was determined using a short form of Ryff's Scales of Psychological Well-Being (SPWB) according to Ryff et al. (2007). SPWB is an 18-item questionnaire which measures multiple facets of psychological well-being which include autonomy, environmental mastery, personal growth, positive relations with others, purpose in life and self-acceptance subscale items. The Autonomy subscale items are 15, 17, and 18. The Environmental Mastery subscale items are 4, 8, and 9. The Personal Growth subscale items are 11, 12, and 14. The Positive Relations with Others subscale items are 6, 13, and 16. The Purpose in Life subscale items are 3, 7, and 10. The Self-Acceptance subscale items are 1, 2, and 5. Items 1, 2, 3, 8, 9, 11, 12, 13, 17, and 18 were reverse-scored. Higher scores indicate higher psychological well-being in all dimensions. Sample questions are "I like most part of my personality", and "Some people wander aimlessly through life, but I am not one of them." The scale employed a seven-point rating scale: 7 = strongly disagree; 6 = somewhat agree; 5 = a little agree; 4 =uncertain; 3 = a little disagree; 2 = somewhat disagree; 1 = strongly agree.

Method of Data Collection: A total of 146 copies of the questionnaire were distributed by hand to the respondents, with the help of one staff from each of the three schools who served research assistant. These staff ensured that the questionnaires were completed and returned. The respondents were given one week to fill out the questionnaires.

The researcher recorded a 100% return of the completed questionnaire.

Data and Statistical Analysis: The data from the questionnaire were coded and entered into statistical product and service solutions (IBM-SPSS version 23.0). Burnout items 1, 4, 15, 17 and 29 were reverse coded to obtain uniform polarity of items. Total Burnout and STS scores ≤ 22 were categorized as low; 23 - 41 were grouped as moderate while scores ≥ 42 were categorized as high levels of burnout and STS. The overall compassion fatigue index was obtained by summing up scores on burnout and STS dimensions. The obtainable score ranges from 20 to 80. Scores ranging from 20 - 40 were categorized as low fatigue, 41-79; as moderate fatigue and 80-100 as high fatigue. SPWB scores of the respondents were computed for each of the subscales where higher scores indicate better psychological well-being and lower scores indicate poorer well-being. The composite score for psychological well-being was obtained for each respondent by summing up the scores of the subscales. The summed scores were also categorized as low, moderate and high. Data were presented in percentages and frequencies. Pearson's correlation was used to determine the association between interval variables while Chi-square was used to determine the relationship between categorical variables. The level of significance was accepted at $p < 0.05$.

Results

Table 1 shows the socio-demographic information of the respondents. From the table, a majority (87.7%) of them were female and 12.3% of them were male. Many (84.9%) of them were < 40

years while 15.1% of them were 40 years and above. A good number (67.1%) of them were married. Many (70.5%) of them had NCE/OND while a few (7.5%) of them had a post-graduate degree. A good number (78.8%) of them were employed full-time while 18.5% of them were in part-time employment.

About (82%) of them earned below ₦41,000 per month and 2.7% of them earned greater than ₦140 and above monthly; More than half (50.7%) of them had 5 – 10 years of working experience and 4.8% of them had worked >10 years.

Table 1: Socio-economic characteristics of the respondents, N = 146

Variable	frequency	percentage%
Gender		
Male	18	12.3
Female	128	87.7
Age		
< 40 years	124	84.9
≥ 40years	22	15.1
Marital status		
Single	37	25.3
Married	98	67.1
Widowed	11	7.5
The highest level of education attained		
Senior secondary school	16	11.0
NCE/OND	103	70.5
University degree/HND	27	17.5
Income per month		
<₦40,000	119	81.5
≥₦40,000	27	18.5
Years of working as a special school teacher		
less than 5 years	65	44.5
≥5 years	81	55.5

NCE-Nigeria Certificate in Education, OND-Ordinary National Diploma, HND-Higher National Diploma.

Table 2 shows the level of compassion fatigue among the respondents. From the table, the majority (97.3%) of the respondents experience moderate overall compassion fatigue. In the different dimensions, 95.9% had

moderate burnout and 70.5% had moderate secondary traumatic stress. None of the respondents experienced high burnout or secondary traumatic stress.

Table 2: Level of compassion fatigue among the respondents

Compassion Fatigue Dimension	Low F (%)	Moderate F (%)	High F (%)	Total
Burnout	6 (4.1)	140 (95.9%)	0 (0)	146 (100)
Secondary Traumatic Stress	43 (29.5%)	103 (70.5)	0 (0)	146 (100)
Overall Compassion Fatigue	4 (2.7)	142 (97.3)	0 (0)	146 (100)

F; frequency, %; percentage

Table 3 presents the level of psychological well-being of the respondents. From the data, about a quarter (24.7%) of the respondents had low overall psychological well-being. In the various dimensions, 32.9% of the respondents had low autonomy, 22.6% had low environmental mastery, 34.9%

had low personal growth, 41.8% had low positive relation, 40.4% had a low purpose in life, 19.2% had low self-acceptance. Less than half of the respondents reported a high level of psychological well-being in all its dimensions.

Table 3: Level of Psychological well-being of the respondents

Dimensions of Psychological well-being	Low F (%)	Moderate F (%)	High F (%)	Total
Autonomy	48 (32.9)	32 (21.9)	66 (45.2)	146 (100)
Environmental mastery	33 (22.6)	62 (42.5)	51 (34.9)	146 (100)
Personal Growth	51 (34.9)	39 (26.7)	56 (38.4)	146 (100)
Positive Relation	61 (41.8)	67 (45.9)	18 (12.3)	146 (100)
Purpose in Life	59 (40.4)	57 (39.0)	30 (20.5)	146 (100)
Self-Acceptance	28 (19.2)	86 (58.9)	32 (21.9)	146 (100)
Overall Psychological well-being	36 (24.7)	66 (45.2)	44 (30.1)	146 (100)

F=frequency; %=percentage

Table 4 shows the relationship between compassion fatigue and the psychological well-being of the respondents. The data showed that burnout was significantly ($p < 0.05$) and positively associated ($r = 0.212$) with environmental mastery ($r = 0.186$) and

purpose in life. Secondary traumatic stress was negatively associated with positive relations with others ($r = -0.231$) and self-acceptance ($r = -0.164$). Overall compassion fatigue was negatively associated with positive relations with others.

Table 4: Relationship between compassion fatigue and psychological well-being of the respondents

	Burnout	Secondary Traumatic Stress	Overall compassion fatigue
Autonomy	0.090	-0.152	-0.052
Environmental mastery	0.212*	0.053	0.153
Personal growth	0.020	-0.157	-0.094
Positive relationships with others	-0.044	-0.231**	-0.178*

Purpose in life	0.186*	-0.014	0.094
Self-acceptance	0.002	-0.164*	-0.108
Overall psychological well-being	0.110	-0.153	-0.041

*; values are significant at $p < 0.05$, **; values are significant at $p < 0.001$

Discussion

Demographic/socio-economic characteristics

The findings of the study showed that the majority of the teachers were females, mostly within the age bracket of 20 - 40 years while few of them were in the age bracket of 60 years and above. A good number of them were married and few of them were unmarried. Many of them had their NCE/OND while a few of them had a post-graduate degree. A good number of them were employed full-time while few of them were in part-time employment. The majority of them earned below ₦41,000 per month and can be classified as low-income earners, while a few of them earned ₦140 and above monthly that are classified as high-income earners; More than half of them had 5 - 10 years of working experience and a few of them had above 10 years. More than half of them studied courses related to special education and few numbers of them did not

Level of Compassion Fatigue

The finding showed that a high proportion (97.3%) of special educators were found to experience compassion fatigue at a moderate level, both in the dimensions of burnout and secondary traumatic stress. This finding indicates that caring for special needs children at school could lead to a feeling of exhaustion, frustration and a sense of sharing in the challenges faced by the children. Similar findings were made among primary school educators in

West Virginia (Robinson, 2005); crisis counsellors after the Oklahoma City bombing (Wee & Myers, 2003), hospice nurses (Abendroth & Flannery, 2006), emergency nurses (Hooper et al., 2010), and oncology nurses (Black, Deignan & Potter, 2014). This current finding highlights the need for timely formulation and implementation of policies and programmes targeted at creating awareness, concerning compassion fatigue among special teachers and equipping them with adequate management and coping strategies. As observed by Ewing (2021), if compassion fatigue among teachers is not identified and addressed, it could lead to a more severe mental breakdown and physical illness, which will affect their personal and career life and in turn affect the children in their care.

Psychological well-being of the respondents

The psychological well-being of teachers is critical because it addresses the realization of human talents and potential, which is required for innovation and creativity in the profession (Zaki, 2016). The finding of the study showed that about a quarter of the special teachers experienced diminished psychological well-being mostly in the aspects of autonomy, positive relationships with others, personal growth and purpose in life. This implies that working with children with various disabilities might have a negative impact on the teachers'

capability to handle challenging situations and ability to control their behaviours under pressure. This finding is expected because children with a disability usually find it difficult to carry out necessary instructions and observe simple rules. This might lead to constant chaotic classroom situations. Hence, teachers might find classroom management and control very hectic and quite taxing on their psychological resources thereby limiting their sense of being healthy, happy and prosperous (Davis, 2019).

Being a special educator could also affect the teachers' perception of personal development over time as well as how purposeful they view their lives (Van-Dierendonck et al., 2008). One of the non-material rewards of being a teacher is seeing pupils advance across the educational ladder. As the pupils successfully graduate from their class to the next, the teacher feels a sense of accomplishment and progress in his or her career. However, this might not often be the experience of special teachers, as many of their pupils might not be making such progress. Therefore, it is likely that a good number of them might feel they are not working productively and making a positive contribution to their community (Slade, 2010).

Relationship between compassion fatigue and psychological well-being of the respondents

The finding of the study showed that secondary traumatic stress and overall compassion fatigue were negatively associated with positive relations with others. This indicates that the more special teachers felt meaningfully connected to other people, the less they

tend to experience frustration and hopelessness associated with caring for children with disabilities. Having a positive relationship with people, also indicated a significant decrease in secondary traumatic stress and compassion fatigue in general. These findings suggest a crucial need for teamwork and the provision of a supportive environment for special teachers. Hakanen et al. (2008) recommend the provision of social support for teachers to lower the risk of compassion fatigue and burnout and lessen educators' vulnerability to the development of both traumatic and work-related stress responses. Confounding evidence was found in the association between burnout and aspects of psychological well-being. The finding suggests that individuals who showed higher environmental mastery and purpose in life also showed a higher level of burnout. Although this finding is unexpected, it suggests that teachers who mostly saw life as being very purposeful and viewed themselves as being capable of bringing situations under control were more likely to develop the rescuer attitude towards their pupils. Robinson (2005) noted that such teacher might over-engage their psychological resources in helping the children and therefore develop a higher level of sadness and frustration over time if they do not get their expected standard of the outcome.

Conclusion

Compassion fatigue was prevalent among the special educators at a moderate level both in the dimension of burnout and secondary traumatic stress (STS). Although the majority of the teachers reported moderate to a high

level of psychological well-being, a reasonable proportion of them showed diminished well-being, especially in the aspects of positive relationships with others, purpose in life, personal growth and autonomy. Having a positive relationship with people was found to be associated with less vicarious stress and compassion fatigue in general. However, the feelings of environmental mastery and purpose in life were found to increase the level of burnout among the teachers, suggesting the mediating role of over-engagement.

Recommendations

Based on the findings of the study, the following recommendations were made:

1. The ministry for education should provide opportunities for seminars, workshops or training for these special needs educators, to teach them new and more efficient ways to handle the fatigue that comes with the job.
2. There is a need for social support from society as this could encourage the teachers to do more.
3. The government should also provide a conducive environment for teaching and learning as this would help reduce the stress encountered by the teachers.

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Utilization of Home Economics Laboratory in Teaching Senior Secondary School Students in Udenu Local Government Area Schools of Enugu State

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Abstract

The study investigated the utilization of home economics laboratories in teaching senior secondary school students in Udenu local government area of Enugu State. The study adopted a descriptive survey research design. Three objectives and three research questions guided the study. The population of the study was made up of 48 Home Economics teachers. The entire population was used for the study. The instrument for data collection was a questionnaire. Data collected were analyzed using mean and standard deviation. Based on the data analyzed, the study identified the tools and equipment available in Home Economics Laboratories, revealed 15 items as the problems encountered by Home Economics teachers in the utilization of laboratories in the teaching of Home Economics while 14 items were revealed as ways of solving the problems encountered by Home Economics teachers in the utilization of the laboratories. The study, therefore, recommended that; the tools and equipment in Home Economics Laboratories should be easily made available for the teaching and learning of Home Economics by the school administration, Education school board and school heads should adequately provide funds to Home Economics secondary schools teachers to make sure there are adequate provisions of laboratory tools and equipment to sustain regular practical activities in school, again Vocational and technical education board should organize regular in-service training for Home Economics teachers on how to make use of the recent technologies in practical teaching since some teachers do not have the skills on how to operate some equipment among others.

Keywords: Home Economics, Laboratories, Utilization, Teaching, Senior Secondary, Students

Introduction

Over the last few decades, the quality of education in Nigeria has continued to decline to lead to the growing population of unemployable graduates and increasing incidence of functional illiteracy across the nation (Olukanni,

Aderonmu & Akinwumi, 2014). For a country to develop, it must have adequate human capital to do so, the human capital is obtained through sound education. It is believed that education is a pivotal part of human development, and can positively

influence standards of living, health and governance (Hamidu, Ibrahim & Mohammed, 2014). Schools handle the important responsibility of imparting knowledge to students and developing them into responsible and enterprising citizens. One of the courses that help the achievement of this objective is Home Economics Education.

Home Economics is one of the subjects that is taught in secondary schools. Nwankwo (2009) opined that Home Economics has been identified as a field of study that can help youths off the street from searching for employment. Molokwu (2007) noted that Home Economics is both interdisciplinary and multi-disciplinary and is a field of knowledge with numerous saleable skills which make for self-employment and self-reliance.

Home Economics is a skill acquisition subject that can create job opportunities for secondary school students when learnt. It equips students with the knowledge, skills and attitudes required for programmes in its areas taught in senior secondary schools such as Food and Nutrition, Home Management, Clothing and Textiles, among others. Home Economics Education aims at promoting personal growth as its objectives and contents are geared towards educating individuals about family living and self-reliance (Nkwodimmah & Okoh, 2014).

In the teaching of Home Economics, the practical aspect should be taught thoroughly to enable the students to acquire the necessary skills. Dada (2007) noted that practical work contributes to moulding students' minds about work. It also provides chances for the learner to directly practice the theoretical knowledge gained. Ohwovoriole &

Ochonogor (2008) noted that putting theoretical knowledge into practice to increase the mastery of knowledge acquired is very important. This can only be done through adequate utilization of the Home Economics laboratory as an integral part of the instructional process adopted by teachers.

A laboratory could be conceptualized as a place, where theoretical work is practicalized and practical in any learning experiences involving students in activities such as observing, counting, measuring, experimenting, recording and carrying out fieldwork (Yara, 2010). With the laboratory experience, students will be able to translate what they have read in their texts to practical realities, thereby enhancing their understanding of the learnt concepts (Kofo, 2012). A laboratory is a room or a building specially built for teaching by demonstration of theoretical phenomena in practical terms.

Laboratories and their usage have been identified as very important and essential to the teaching of science and the success of any science subject (Yara, 2010). Laboratories have the potential to develop students' abilities and skills such as: posing scientifically oriented questions, forming hypotheses, designing and conducting scientific investigations, formulating and revising scientific explanations, and communicating and defending scientific arguments (Hofstein & Mamlok-Naaman, 2007). This and a lot of other reasons explain the reason why laboratory adequacy, which is a school environment factor has been reported to affect the performance of students (Raimi, 2002; Adeyemi, 2008). Active engagement in laboratory exercises

promotes a thorough understanding of the concepts described in theory classes, hence this helps to achieve the aims of Home Economics as a skill-oriented subject.

In Udenu L.G.A, the rate at which Home Economics teachers adopt the use of laboratories in instruction is dwindling. Home Economics as a subject instils creativity in students and makes them resourceful and self-reliant. This feat cannot be achieved if the teachers keep ignoring the importance of the laboratory in teaching and learning. Nwankwo (2009) noted that practical work help students develop manipulative skills that will give them the confidence and ability to perform effectively in any given situation. In Udenu L. G.A. some teachers do not usually find it convenient to make laboratory work the centre of their instruction. They usually complain about the lack of materials and equipment to carry out practical work. At the same time, it is possible that some of these materials and equipment may be locked up in the school laboratory store, but they choose to avoid the rigours of laboratory work as some of them are not knowledgeable in practical aspects and lack skills in the use of some laboratory equipment. The conditions under which many teachers function do not engender any enthusiasm to use the laboratory method of teaching even where they know that these materials and equipment are available. Class size in urban schools is getting larger and this does not usually encourage teachers to use the laboratory method to teach. Other problems in the study area include a lack of adequate laboratories, poorly furnished laboratories, and

insufficient and obsolete laboratory equipment, among others.

Skills acquired in Home Economics improve students' capabilities for job creative ventures. With adequate practical work in Home Economics, students will be competent to face economic challenges and survive in the existing unemployment situations. Hence this study seeks to identify strategies for improving Home Economics laboratories in Secondary Schools in Udenu local government area of Enugu state.

Purpose of the Study

The main purpose of the study was to investigate the use of laboratories in the study of Home Economics in senior secondary school schools in Udenu local government area of Enugu state. Specifically, the study identified;

1. tools and equipment available in- Home Economics laboratories in the teaching of secondary school students.
2. problems encountered by Home Economics teachers in the utilization of Home Economics laboratories in the teaching of secondary school students.
3. ways of solving the problems encountered by Home Economics teachers in the utilization of Home Economics laboratories.

Methodology

Design of the Study: The study adopted a descriptive survey design.

Area of the Study: The study was carried out in Udenu local government area of Enugu state, Nigeria. Its headquarters are in the town of Obollo-Afor. Udenu local government area has sixteen secondary schools that offer

Home Economics subjects at the Junior secondary and senior secondary levels in the different craft areas.

Population for the Study: The population for the study comprised 48 Home Economics teachers in Udenu local government area of Enugu. (Personal enquiry from Post Primary School Management Board [PPSMB] Obollo Afor Educational Zone). The entire population was used for the study because it was manageable, and there was no sampling.

Instrument for Data Collection: A questionnaire titled Home Economics Laboratories and Its Utilization in Secondary Schools (HELUSS) was used for data collection. The questionnaire was made up of two parts; part I elicited demographic and bio data while part II was made up of three sections. Each section was designed to meet the objective of the study using appropriate items. Cluster 1 was designed to elicit responses from respondents on the tools and equipment available in Home Economics laboratories in secondary schools in Udenu local government area. In Cluster 2, the questionnaire was designed to collect information on the problems encountered by Home Economics teachers in Home Economics laboratories in secondary schools in Udenu local government area; while in Cluster 3, the questionnaire was geared towards identifying ways of solving the problems encountered by Home Economics teachers in the use of Home Economics laboratories in secondary schools in Udenu local government

area. The instrument adopted a modified four-point Likert scale with response options of Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD).

Validation of the Instrument: The questionnaire was validated by three experts in the Department of Home Economics and one expert from the department of Science Laboratory Technology. Some corrections pointed out were grammatical errors, restructuring of some items and removal of three items seen as irrelevant to the purpose of the study. Corrections were effected based on the corrections of the validators, leading to the production of the final draft of the instrument.

Method of Data Collection: Forty-eight (48) copies of the questionnaire were distributed by hand. The researcher briefed two research assistants who helped with the distribution of the questionnaires and explained the items to the respondents when necessary. All the questionnaires were duly filled and returned giving a 100% return rate.

Method of Data Analysis: Mean and standard deviation were employed for the data analysis. In taking a decision, all items with mean scores which were 2.5 and above, were regarded as being agreed upon by the respondents as a positive answer to the item. While any item with a mean score below 2.5 was therefore regarded as being disagreed upon by the respondents. Hence, the mean score of 2.5 was the decision rule for this study.

Table 1: Mean Responses and Standard Deviation on the tools and equipment available in-Home Economics laboratories in the study area

Tools and equipment available in-Home Economics lab	\bar{X}	S. D.	Remarks
Clothing and Textiles Laboratory			
Tape measure and rulers	3.99	0.13	Agreed
Fashion Magazine	2.98	0.94	Agreed
Standard measurements	2.80	1.02	Agreed
Tracing wheel	2.11	1.94	Disagreed
Dressmaker's pencil	2.78	1.12	Agreed
Tailor's chalk	3.30	0.96	Agreed
Tracing paper	2.06	1.35	Disagreed
Scissors	3.37	0.89	Agreed
Cutting Tables	3.83	0.99	Agreed
Needles of different sizes	3.81	0.35	Agreed
Dressmakers' pins of different sizes	3.16	0.89	Agreed
Pin magnets	3.00	0.96	Agreed
Thread (different colours)	3.68	0.44	Agreed
Ironing board	2.35	1.08	Disagreed
Pressing iron	3.35	0.85	Agreed
Hangers	2.53	0.95	Agreed
Wardrobe	2.98	1.03	Agreed
Fitting Mirror	2.83	0.80	Agreed
Sewing machines	3.39	0.79	Agreed
Food and Nutrition Laboratory			
Gas Cooker	3.70	0.80	Agreed
Baking Oven	2.88	1.08	Agreed
Working Tables	2.74	1.19	Agreed
Shelves and cupboards	3.24	0.70	Agreed
Refrigerator	2.50	1.02	Agreed
Deep freezers	2.37	0.96	Disagreed
Blenders	2.66	0.98	Agreed
Mortar and Pestle	3.57	1.03	Agreed
Kitchen Sink	2.22	1.25	Disagreed
Mixer	2.32	1.03	Disagreed
Cake pans	3.41	0.80	Agreed
Serving Dishes	2.79	1.11	Agreed
Cutlery	3.52	0.78	Agreed
Teapots and tea cups	3.01	0.82	Agreed
Aprons	3.66	0.68	Agreed
Different types and sizes of pots	3.83	0.23	Agreed
Frying Pan	3.21	0.74	Agreed
Different types and sizes of plates	3.88	0.21	Agreed

Key: \bar{X} = Mean responses, SD = Standard Deviation of the responses

Table 1 shows the tools and equipment available in the Home Economics laboratories. From the table, results show that the most prevalent tools in the Clothing & Textiles laboratory are a tape measure and rulers (3.99), tailors chalk (3.30), scissors (3.37), cutting tables (3.83), needles of different sizes (3.81), thread (different colours) (3.68) and pressing iron (3.35). For the Food and Nutrition laboratories, the results show that the most prevalent tools are gas cookers (3.70), mortar and pestle (3.57), aprons (3.66), different types and

sizes of pots (3.83) and different types and sizes of plates (3.88) which were equal to or above the cut off mark of 2.50. The results also show that the respondents disagree on some items as being unavailable in the Home Economics laboratories. For Clothing & Textiles, the items include; Tracing wheel (2.11), Tracing paper (2.06) and Ironing board (2.3) whilst for the Food and Nutrition Laboratory the unavailable tools include: Deep freezers (2.37), Kitchen Sink (2.22) and Mixer (2.32).

Table 2: Mean Responses and Standard Deviation on problems encountered by Home Economics teachers in Home Economics laboratories in the study area

Problems encountered by Home Economics teachers	\bar{X}	S. D	Remarks
Lack of funds to maintain laboratory equipment	2.78	1.11	Agreed
Lack of well-designed work surfaces with sinks and water supply	2.97	1.06	Agreed
No approved guidelines for laboratory equipment usage by both staff and students	2.75	1.15	Agreed
Inadequately equipped laboratory	3.24	0.96	Agreed
Lack of interest of teachers in conducting practical classes	3.09	0.95	Agreed
Little time on the timetable to accommodate practical sessions	2.92	1.05	Agreed
Focusing of the teacher on finishing the scheme of work early and thus teaching practical classes theoretically to save time.	3.12	0.97	Agreed
Teacher pays little or no attention to practical activities	2.99	1.00	Agreed
Lack of laboratory attendants to assist the teacher during practical classes	3.04	1.03	Agreed
Lack of laboratory space to accommodate the number of students to be taught	2.97	1.13	Agreed
Lackadaisical attitude on the part of the school administration in purchasing items needed	3.26	0.94	Agreed
Lack of appropriate remuneration and allowances for teachers	2.92	1.04	Agreed
Inadequate provisions of textbooks and practical guides	2.97	1.06	Agreed
Lack of maintenance of laboratory equipment due to negligence	2.92	1.00	Agreed
Lack of students' interest in being part of practical classes	2.89	1.00	Agreed

Key: \bar{X} = Mean responses, SD = Standard Deviation of the responses

Table 2 shows the problems encountered by Home Economics teachers in Home Economics laboratories in Secondary schools in Udenu local government area. Table 2

shows that the items have a mean score ranging from 2.75 to 3.26. All these means are above the cut-off point of 2.50. There are all agreed. This also shows that all the items are considered

as the problems encountered by Home Economics teachers in Home Economics laboratories in Secondary schools in Udenu local government area. The respondents tended to respond similarly to most of the items. This shows that the problems under investigation were peculiar and known to the respondents. The item - Lackadaisical attitude on the part of the school administration in purchasing

items needed, scored the highest mean of 3.26. Therefore, the respondents saw this as a very important problem encountered by Home Economics teachers. Also, the degree of agreement with item 3 - "No approved guidelines for laboratory equipment usage by both staff and students" which has the least mean of 2.75, further emphasizes that some problems were more prevalent than others.

Table 3: Mean Responses and Standard Deviation on ways of solving the problems encountered by Home Economics teachers in Home Economics laboratories

Ways of solving problems encountered in the laboratory	\bar{X}	S.D.	Remarks
Provision of funds to maintain laboratory equipment	3.80	0.66	Agreed
Provision of well-designed work tables with sinks and water supply	2.79	1.06	Agreed
Provision of approved guidelines for laboratory equipment usage by both staff and students	2.30	1.70	Disagreed
Provision of adequately equipped laboratory	2.89	1.03	Agreed
Motivating teachers to boost interest in conducting practical classes	2.96	1.05	Agreed
Ensuring ample time is provided on the timetable to accommodate practical sessions	3.15	0.97	Agreed
Reorientation of teachers on the importance of teaching practical concepts in the laboratory.	2.89	1.01	Agreed
Teachers should pay apt attention to practical activities	3.04	0.96	Agreed
Provision of laboratory attendants to assist teachers during practical classes	2.90	1.04	Agreed
School administration should ensure the prompt provision of funds for purchasing items needed in the laboratory.	2.95	0.98	Agreed
Ensure the provision of laboratory space to accommodate the number of students to be taught	3.00	1.08	Agreed
Ensure that appropriate remuneration and allowances for teachers are paid as and when due	3.08	1.00	Agreed
Ensuring the provisions of textbooks and practical guides	3.01	1.03	Agreed
Regular maintenance of laboratory equipment to ensure its durability	3.34	0.93	Agreed
Boosting students' interest in being part of practical classes by making learning to be fun and lively.	3.27	0.92	Agreed

Key: \bar{X} = Mean responses, SD = Standard Deviation of the responses

In Table 3, all the items got a mean score that was above the cut-off point except item number 3 on the provision of approved guidelines for laboratory

equipment usage by both staff and students. Therefore, the respondents accept that all the items listed are the ways of solving the problems

encountered by Home Economics teachers in Home Economics laboratories in Secondary schools in Udenu local government area except item 3. Item 3 which suggests the Provision of funds to maintain laboratory equipment received the highest mean of 3.80.

Discussion of Findings

The findings of the study present the following as the tools and equipment adopted in the Home Economics laboratories including for the Clothing and Textiles Laboratory; tape measure and rulers, fashion magazine, standard measurements, dressmaker's pencil, tailors chalk, scissors, cutting tables, needles of different sizes, dressmakers' pins of different sizes, pin magnets, thread (different colours), pressing iron, hangers, wardrobe, fitting mirror, sewing machines. For the Food and Nutrition laboratory the following tools and equipment were identified; gas cooker, baking oven, working tables, shelves and cupboards, refrigerator, blenders, mortar and pestle, cake pans, serving dishes, cutlery, teapots and tea cups, aprons, different types and sizes of pots, frying pan and different types and sizes of plates. However, an extensive literature review of literature conducted by the researcher showed that there was no empirical study in the literature that captures tools and equipment adopted in Home Economics laboratories. Hence, this study serves as a pilot study.

The findings of the study also show that the problems encountered by Home Economics teachers in Home Economics laboratories includes the following; lack of funds to maintain laboratory equipment, lack of well-

designed work tables with sinks and water supply, no approved guidelines for laboratory equipment usage by both staff and students, inadequately equipped laboratory, lack of interest of teacher in conducting practical classes, little time on time table to accommodate practical sessions, focusing of teacher on finishing scheme of work early and thus teaching practical classes theoretically to save time, teacher pays little or no attention to practical activities, lack of laboratory attendants to assist teacher during practical classes, lack of laboratory space to accommodate the number of students to be taught, lackadaisical attitude on the part of the school administration in purchasing items needed, lack of appropriate remuneration and allowances for teachers, inadequate provisions of textbooks and practical guides, lack of maintenance of laboratory equipment due to negligence, and lack of students' interest in being part of practical classes. These findings of this study on problems encountered in laboratories were also identified in studies conducted by Boyo (2011); Chukwunenye & Adegoke (2014); Chukwunenye (2015); Cossa & Uamusse (2015); Kaping'ei & Rutto (2014) and Tsuma, (2007).

In research, it is expected that for every problem that arises, solutions should be provided to mitigate its effects. To this end, the present study also identified possible solutions to the problems encountered by Home Economics teachers in Home Economics laboratories. The possible solutions includes the following; provision of funds to maintain laboratory equipment, provision of well-designed work surface with sinks and water

supply, provision adequately equipped laboratory, motivating of teacher to boost interest in conducting practical classes, ensuring ample time is provided on time table to accommodate practical sessions, reorientation of teachers on the importance of teaching practical concepts in laboratory, teacher should pay apt attention to practical activities, provision of laboratory attendants to assist teacher during practical classes, school administration should ensure the prompt provision of funds for purchasing items needed in the laboratory, ensure provision of laboratory space to accommodate the number of students to be taught, ensure that appropriate remuneration and allowances for teachers are paid as and when due, ensuring the provisions of textbooks and practical guides, regular maintenance of laboratory equipment to ensure its durability, and boosting students' interest in being part of practical classes by making learning to be fun and lively. These findings of this study on possible solutions to problems encountered in laboratories were also identified in studies conducted by Kaptin'ei & Rutto (2014); Hamidu, Ibrahim & Mohammed (2014); Allen, et al. (2009); Adegoke (2017); Prabha (2016) and Ndiokubwayo (2017)

Conclusion

Quality education is achieved when the science laboratory and the laboratory in the context of teaching and learning science are made relevant regarding research issues as well as developmental and implementation issues. It is quite obvious that the laboratory space should be available to the teacher during the planning and preparation period and available to

students for special projects, makeup laboratories, etc. outside their regular class hours. Each student should have his/her laboratory workspace. To that end, science teachers must be provided with an annual budget sufficient to purchase both expendable material and equipment necessary to conduct inquiry-based learning that is believed to enhance quality learning.

Recommendations

Based on the findings of the study, it was recommended that:

1. Curriculum planners should utilize the findings of the study as a useful guide during future curriculum review exercises to ensure that the curriculum content of Home Economics is adjusted using the strategies to solve these problems as provided by this study.
2. Government and school heads as the case may be should adequately provide funds to secondary schools to make sure there are provisions for laboratory consumables to sustain regular practical activities in schools.
3. The vocational and Technical Education Board should organize regular in-service training for Home Economics teachers on how to carry out most of the more recent technologies utilized in practice since most of them do not have the skills.

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Engagement in Leisure Activities and Academic Performance of Primary School Pupils in Enugu East Local Government Area

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Abstract

This study determined engagement in leisure activities and academic performance of pupils in Enugu East LGA. A cross-sectional survey research design was employed. The study population was 60,576 pupils in the 474 private schools and 20,874 pupils in the 58 public schools in the study area. The multi-stage sampling procedure was used to select a sample of 352 pupils. Three specific objectives guided the study. A structured questionnaire was used for data collection. Frequencies, percentages, means, standard deviation and chi-square were used for data analysis. Findings showed that based on mean responses, the following active leisure activities were highly engaged by the respondents; swimming (3.53), visiting (3.27), gardening (3.27), running (2.47), climbing (3.00), dancing (3.00), dramatic play (3.00) and riding bicycle (2.73). Findings also showed that passive activities with very high engagement included writing a story (3.27), sleeping (3.73), playing a musical instrument (3.20), reading books (3.07), drawing and painting (2.47), listening to music (2.40) and playing card games (2.13). The finding further showed that a greater percentage of them had very high academic performance (66.50%), 33.40% had high academic performance while only 6.50% had an average academic performance. Better academic performance of the pupils was significantly associated with moderate engagement in active leisure activities, but not with engagement in passive leisure activities at $p < 0.05$ level of significance. It was therefore recommended that more time for engagement in active leisure activities be made available to pupils as it might help them in improving their academic performance.

Keywords: Leisure activity, Engagement, Academic performance, Pupils, School

Introduction

Leisure activity encompasses the activities that people engage in for reasons as varied as relaxation, competition, or growth. Leisure activities can also be viewed as activities that people engage in during their free time, activities that are not work-oriented or that do not involve life

maintenance tasks (Hurd & Anderson, 2020). Leisure activities are engaged, at different points in daily activities to refresh, be physically fit again, and be mentally alert to start or continue with work (Dansu & Uchegbu, 2007). These activities take place during time away from work and are not engaged in, just for existence (Hurd & Anderson, 2020).

They include meditating, painting, playing, studying, computer usage, watching television, art, hobbies, sports, reading, spending time outdoors and shopping (Hofferth & Curtin, 2003).

The benefits of leisure time depend on its purpose. Structured and active activities are generally considered more beneficial than unstructured and passive activities. However, all forms of leisure activities have the potential for positive outcomes for children (Hofferth & Curtin, 2003). First, these activities can function as learning environments for mastering specific skills and techniques. Secondly, they promote positive relationships with peers. Thus, many leisure activities can provide learning opportunities and have positive behavioural, health and academic outcomes (Hurd & Anderson, 2020).

The academic performance of students is currently a major controversial issue in educational research, due to its relevance and complexity (Lamas, 2015). Academic performance is the quantitative result obtained during the learning process, based on the evaluations carried out by the teachers through objective test evaluations (Martin et al., 2017). It is a measure of the indicative and responsive abilities that express, in an estimated way, what a person has learned as a result of a process of education or training (Lamas, 2015). For Caballero et al. (2007), academic performance involves meeting goals, achievements and objectives set in the program or course that a student attends. There are different methods of measuring academic performance in children, such as standardized achievement test scores, teacher ratings

of academic performance, and report card grades (Alvarez-Peregrina, et al., 2020). A child's academic performance is a function of factors such as intellectual capacity, personality, motivation, skills, interests, study habits, self-esteem, the teacher-student relationship, family income, parents' educational qualification, teacher-pupil ratio, teacher qualification, gender, and opportunities to engage in leisure activity (Lamas, 2015).

A positive relationship between leisure activity and academic performance has been explored through several studies and the results suggested that when a substantial amount of school time is dedicated to leisure activity (especially active activities), academic performance meets and may even exceed that of pupils not receiving additional leisure activities (Kayani et al., 2018; Scheuer & Mitchell, 2002). A comparison between students who are involved in leisure activities and who are not involved has been conducted by Trudeau and Shephard (2008), and it resulted in a positive significant relationship between involvement in leisure activities and academic performance indicating that academic performance is improved with engagement in leisure activities. Children receiving additional leisure activity tend to show improved attributes such as increased brain function and nourishment, higher energy levels, and changes in body build leading to increased self-esteem and better behaviour, which may all support cognitive learning (Scheuer & Mitchell, 2002). The increased energy levels and time outside of the classroom may give relief from boredom, resulting in higher attention levels during

classroom instruction, according to Scheuer and Mitchell (2002).

Juvenile lifestyle has changed over recent decades towards a more sedentary lifestyle with higher usage of audiovisual media (Hilpert et al., 2017). As the popularity of sedentary behaviours, such as watching television, using the internet and video games increases, children tend to spend more time on them (Little & Wyver, 2008). This lack of participation in physical activity has contributed to a greater prevalence of pediatric obesity, a decrease in fitness, and a greater risk for health problems (Steele et al., 2008). It is currently recommended that to stay healthy, children need at least 60 minutes of moderate to vigorous physical activity daily. A study by Maina (2014) involving 138 children between ages 9-11 identified a lack of role models, lack of time and excessive screen time as some of the reasons why children do not engage in physical activities. Additionally, modern-day family life can be hectic, making it challenging to find the time and energy to engage in active leisure activities. Currently, primary schools are becoming more academically oriented, preferring to allocate almost all the school hours to intellectual activities, with little or no time for recess and sports (Maina, 2014). While the effects of physical activity have been extensively studied, the potential role of leisure time activities on the academic performance of children has not been widely explored in Africa. The aim of this study was therefore to determine the association between engagement in leisure activities and academic performance of school-aged children in

Enugu East local government area, Enugu State.

Objectives of the study

The broad objective of this study was to determine engagement in leisure activities and academic performance of primary school pupils in the Enugu-East local government area. The specific objectives of the study were to:

1. ascertain the level of engagement in active and passive leisure activities by primary school pupils in the Enugu-East local government area.
2. assess the level of academic performance of primary school pupils in the study area.
3. determine the association between the level of engagement in leisure activities and the academic performance of primary school pupils in the Enugu-East local government Area.

Methodology

Study area: This study was carried out in Enugu-East Local government area, Enugu State. Enugu-east local government area is home to over 500 public and private primary schools in addition to secondary and tertiary institutions (Ministry of Education, Enugu State, 2021).

Study design: This study employed a cross-sectional survey design. A cross-sectional study has the ability to examine the current situation in a given place in order to ascertain the extent to which current practices meet the required standard (Uzoagulu, 2008).

Population of the study: The study population comprised 60,576 pupils in the 474 private primary schools and 20,874 pupils in the 58 public schools in the Enugu-East local government area

(Ministry of Education, Enugu State, 2021).

Sample size determination and sampling technique: Sampling was done in multiple stages. Firstly, 10% of public schools and 2% of private schools were calculated and a systematic random sampling technique was used to select six public schools and 10 private schools from the list of schools. In the second stage, the formula below was used to calculate the sample size for both public and private schools in Enugu-east L.G.A.

$$\text{Sample size} = \frac{\frac{z^2 \times p(1-p)}{e^2}}{1 + \left(\frac{z^2 \times p(1-p)}{e^2 N} \right)}$$

Where: N = Population of the study; n = Sample size; e = Margin error (0.05)

z = z- score (level of confidence); and p = baseline levels of indicators (50%)

This gave a total sample size of 304 pupils from private schools and 326 pupils from public primary schools in Enugu-East local government area. In the third stage, proportionate sampling was used to determine the number of pupils to be sampled from each school. Finally, the purposive sampling technique was used to select primary five and six pupils from each school that served as a sample for the study. The two classes were chosen because the pupils in those classes are expected to understand the simplified questionnaire.

Instrument for data collection: A questionnaire developed after an extensive literature review was the instrument for data collection. It was made up of sections A-C. Section A was used to collect data on the respondents' background information. Section B contains items on how often children

engaged in active and passive leisure activities in the past week. The items were on a 5-point scale - 0 is never, 1 is once a week, 2 is 2-3 times a week, 3 is 4-5 times a week and 4 is every day. Section C was for the 1st and 2nd term overall average result of each respondent, obtained from calculating the scores for all the subjects.

Data collection method: The researchers administered the questionnaires verbally to the pupils with the help of three research assistants. The researchers and their assistants guided the pupils in completing the questionnaires by carefully explaining each item to them. In the end, the questionnaires were immediately collected from the respondents. The average time to complete the questionnaire was 30 minutes and those who were unable to understand the explanations were excluded from the study. Each pupil's 1st and 2nd term average scores were collected from their class teachers and recorded in section C of their questionnaire. Their averages were calculated and used as an academic performance measure. Six hundred and thirty questionnaires were distributed and collected. This gave a percentage return of a hundred.

Data and statistical analysis: Data obtained were coded into Statistical Product and Service Solution (IBM-SPSS), version 21. Descriptive statistics such as frequencies, percentages, means and standard deviation were used for data analysis. The average of the 1st and 2nd term results of the pupils were calculated and the academic performance of the pupils was categorized as poor (below 40), average (40-59), high (60-69) and very high (70-

100). Means of 0-0.4 was regarded as no engagement, 0.5-1.0 = low engagement, 1.1-2.0 = moderate engagement, 2.1-3.0 = high engagement and 3.1-4.0 were regarded as very high engagement. Inferential statistics such as chi-square was used to determine the relationship between categorical variables. A p-value < 0.05 was chosen as the level of significance.

Results

Demographic/socio-economic data of the respondents

Table 1 shows the socioeconomic/demographic characteristics of the respondents. The majority of the respondents were aged 8-10years (46.60%), 33.30% were aged 11-12years and 20.00% were aged more than 12 years. Most of the pupils were males (73.30%) while 26.70% were females. Findings showed that more than a third of the respondents' fathers were farmers (33.30%), 26.70% were civil servants, 20.00% were traders, 13.30% were retired, and 6.70% were artisans. Information on the pupils' mothers showed that 46.70% were traders, 13.30% were farmers and artisans, 6.70% were civil servants and retired and 13.30% were unemployed. Over seventy per cent of the respondents lived in rented homes (73.30%) while 26.70% lived in homes owned by their parents/guardians.

Table 1: Socio-economic/demographic characteristics of the respondents

Variable	f	%
Age (years)		
8-10	294	46.60
11-12	210	33.30
Above 12	126	20.00
Total	630	100
Gender		
Male	462	73.30
Female	168	26.70
Total	630	100
Number of children in the family		
One	42	6.70
2-3	168	46.70
4-6	210	26.70
More than 6	126	20.00
Total	630	100
Father/guardian's occupation		
Artisan	42	6.70
Civil servant	168	26.70
Farmer	210	33.30
Trader	126	20.00
Retired	84	13.30
Unemployed	0	0.00
Total	630	100
Mother/guardian's occupation		
Artisan	84	13.30
Civil servant	42	6.70
Farmer	84	13.30
Trader	294	46.70
Retired	42	6.70
Unemployed	84	13.30
Total	630	100
Housing type		
Renting	462	73.30
Home owners	168	26.70
Total	630	100

Table 2 shows the mean and standard deviation responses on the level of engagement in active leisure activities by the respondents. Active leisure activities that had very high engagement among the respondents were swimming with a mean of 3.53,

visiting places with friends and family (3.27) and working in the garden (3.27). Activities with high engagement include running with friends (2.47), climbing trees (3.00), dancing with friends (3.00), shopping (3.00), skipping rope (2.13), dramatic play (3.00) and riding a bicycle (2.73) among others.

Table 2: Mean and standard deviation responses on engagement in active leisure activities by the respondents

Active leisure activities	Mean	Std Dev	Remark
Playing football with friends	1.67	0.860	Moderately engaged
Swimming/playing in the water	3.53	0.719	Very highly engaged
Running with friends	2.47	1.456	Highly engaged
Climbing trees	3.00	1.318	Highly engaged
Visiting interesting places with friends/family	3.27	0.929	Very highly engaged
Working in the garden	3.27	0.929	Very highly engaged
Dancing with friends	3.00	1.367	Highly engaged
Walking with a pet animal (e.g. dog)	2.87	0.619	Highly engaged
Shopping with family and friends	3.00	0.817	Highly engaged
Skipping rope	2.13	1.148	Highly engaged
Acting drama with friends	3.00	0.817	Highly engaged
Riding bicycle	2.73	0.999	Highly engaged
Floor games (suweh)	2.13	1.456	Highly engaged
Hide and seek	1.73	1.341	Moderately engaged
Ten-ten (oga)	1.67	1.012	Moderately engaged
Hand games (tinko-tinko)	0.93	1.124	Poorly engaged
Fire on the mountain.	2.13	1.025	Highly engaged
Thug of war	3.00	1.367	Highly engaged

Table 3 shows the mean and standard deviation responses on the level of engagement in passive leisure activities by the respondents. Activities that were highly engaged by the respondents were writing a story (3.27), sleeping (3.73) and playing a musical instrument (3.20). Activities with high engagement include reading a book (3.07), drawing and painting (2.47), moulding with clay (2.40), bead making (3.07), listening to music (2.40) and playing card games (2.13) among others.

Table 3: Mean and standard deviation responses on engagement in passive leisure activities by the respondents

Active leisure activities	Mean	Std dev	Remark
Playing games on phones and computers	1.200	0.542	Moderately engaged
Watching the stars	2.467	1.361	Highly engaged
Reading a book	3.067	0.929	Highly engaged
Playing board games (ludo, scrabble, ayo)	2.933	1.341	Highly engaged
Telling stories with family and friends	1.933	0.772	Moderately engaged

Drawing and painting	2.467	1.259	Highly engaged
Moulding with clay	2.400	1.084	Highly engaged
Bead making	3.067	0.929	Highly engaged
Writing a story	3.267	0.574	Very highly engaged
Watching the television	1.667	1.301	Moderately engaged
Listening to music	2.400	1.255	Highly engaged
Singing songs with family and friends	1.533	1.785	Moderately engaged
Sleeping	3.733	0.443	Poorly engaged
Fishing	0.933	1.380	Very highly engaged
Papercraft (e.g. making a boat)	2.067	0.772	Moderately engaged
Playing card games (e.g. Whot)	2.133	1.148	Highly engaged
Playing musical instrument	3.200	0.749	Very highly engaged

Table 4 shows the levels of academic performance of the respondents. A greater percentage of them performed very highly, academically (66.50%), 33.40% performed highly while only 6.50% had an average academic performance.

Table 4: Levels of academic performance of the respondents

Academic performance	<i>f</i>	%
Average performance (40-59)	41	6.50
High performance (60-69)	170	33.40
Very high performance (70-100)	419	66.50
Total	630	100

Table 5 shows the association between the levels of engagement in leisure activities and the academic performances of the respondents. Academic performance was significantly associated with their engagement in active leisure activities. A greater proportion (77.40%) of those that moderately engaged in active

leisure activities performed very highly academically. The academic performance of the pupils was not significantly associated with their engagement in passive leisure activities at $p < 0.05$ level of significance. However, 70.80% of those that highly engaged in passive leisure activities had a very high academic performance.

Table 5: Association between the levels of engagement in leisure activities and academic performance of the respondents

Leisure activities	Average performance F (%)	High performance F (%)	Very high performance F (%)	Total F (%)
Active activities				
Moderate engagement	6 (7.10)	13 (15.50)	65 (77.40)	84 (100)
High engagement	28 (5.50)	138 (27.4)	338 (67.10)	504 (100)
Very high engagement	7 (16.70)	19 (45.20)	16 (38.10)	42 (100)
$\chi^2 = 23.37, df = 4, p = 0.00^*$				
Passive activities				
Moderate engagement	29 (6.30)	133 (28.80)	300 (64.90)	462 (100)

High engagement	12 (7.10)	37 (22.00)	119 (70.80)	168 (100)
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$$\chi^2 = 2.88, df = 2, p = 0.24$$

F = frequency, % = percentage, χ^2 = chi square value, df = degree of freedom, $p < 0.05$ level of significance

Discussion

The findings of this study show that the pupils engaged in various leisure activities such as playing football with friends, swimming, working in the garden, running, climbing trees, dancing, skipping rope, dramatic play, riding a bicycle, writing a story, sleeping, playing a musical instrument, reading a book, drawing and painting and listening to music. Supporting this finding, Rosić (2005), identified some of the activities children take on in their free time including sleeping, viewing television, listening to music, star gazing, playing games, taking walks, storytelling, reading books and pretend play. In addition, Hughes (2017) identified sports, arts and crafts, dance and music, as some of the activities children engage in for relaxation. Kuhn (2017) also gave sports, biking, taking walks, water spray wars, watching television and playing video games as some leisure activities for children.

According to the result of this study, eighty per cent of the pupils highly engaged in active leisure activities while over seventy per cent of them engaged moderately in passive leisure activities. Studies have proven that balanced and moderate engagement in leisure activities develops the minds of children for adulthood. According to Brîndescu (2010), early childhood is a time when leisure activities are critical for socializing, cognitive and moral development, taking diverse roles, and learning how to be distinct from others. Therefore giving leisure activities the attention they deserve during childhood

is the foundation of healthy physical, social and cognitive development, allowing infants to gradually assume various social roles, and develop competencies and talents that they may later use in broader situations such as academic endeavours (Brîndescu, 2010).

Academic performance is the result of learning, prompted by the teaching activity by the teacher and produced by the student through school grades (Lamas, 2015). The results of this study showed that the academic performance of the pupils in this study was generally impressive. Contrary to the findings of Akinsolu (2010) who reported that the academic performance of pupils in Nigeria has over the years been on the decline. In addition, Arong and Ogbadu (2010) observed that many products of Nigerian primary schools have been discovered to be unable to write their names. Sarma, Wijesinghe, and Sivananthawerl (2015) also reported a low level of educational performance in language, mathematics, and the overall subject average among school-aged children. However, the appreciable level of academic performance observed among these pupils, suggests that engaging in leisure activities could have an added advantage to the cognitive functioning of the pupils as observed by Alesi, et al (2014), Chen, et al (2014), Kamijo, et al (2011), Kubesch, et al (2009) and Verburgh, et al (2016).

Researchers have affirmed that among the different ways to improve educational achievement, promoting leisure activities is attracting increasing interest (Pfeifer & Cornelißen, 2010) as it has the advantage of being relatively

cheap and easy to implement and it could be applied at the school level. However, it needs to be balanced as the overall effect of leisure activities on educational outcomes could be both positive and negative (Fernandes et al., 2017). This lends credence to the finding of this study which showed that pupils that engaged very highly in active leisure activities were found to perform less than those who engaged moderately. This indicates that excessive engagement could be counter-productive to the academic performance of children. A positive relationship between leisure activity and academic performance has been explored through several studies and the results suggested that when a substantial amount of school time is dedicated to leisure activity (especially active activities), academic performance meets and may even exceed that of pupils not receiving additional physical activity (Kayani et al, 2018; Scheuer & Mitchell, 2002). In addition, a study by Trudeau and Shephard (2008), showed a positive significant relationship between involvement in leisure activities and academic performance, indicating that academic performance is improved with engagement in leisure activities. This may be attributed to the fact that children receiving additional physical activity tend to show increased brain function and higher energy/concentration levels which may support cognitive learning (Scheuer & Mitchell, 2002). However, it appears that improved academic performance is linked to active rather than passive leisure activities as no association was found between academic performance and passive leisure activities. Golsteyn et al. (2020) even warned that high

engagement in passive leisure activities such as playing video games, watching the television and using the internet may also decrease students' attention to school work or indirectly affect academic outcomes by increasing the allocation of time to these activities.

Limitations of the study: The major limitation of this research work was the use of academic records provided by different class teachers. Teachers' assessments might be subjective in measuring academic performance and this might introduce bias to the study. Using standardized questions for every respondent may have made the result more objective and accurate.

Conclusion

This study determined the association between engagement in leisure activities and the academic performance of pupils in Enugu East LGA. The pupils were actively participating in various leisure activities such as swimming, visiting interesting places, gardening, running, climbing, dancing, dramatic play and riding bicycle. A good number of them also engaged in passive activities such as writing stories, sleeping, playing a musical instrument, reading books, drawing and painting, listening to music and playing card games. The pupil's academic performance was found to be generally high contrary to expectation. However, it was also found that engaging in active, rather than passive leisure activities might have contributed to the impressive academic performance of the pupils. Thus, confirming that integrating active leisure with intellectual activities holds the potential for academic success among school children.

Recommendations

The following recommendations have been made based on the findings of the study.

1. The government and primary school administrators should work together and implement policies that will foster the engagement of moderate leisure activities and as well provide good facilities to cater for that in schools.
2. Parents and pupils should be adequately informed of the benefits of moderate engagement in leisure activities.
3. There should be further studies to examine the association between engagement in leisure activities and the academic performance of pupils at other levels such as secondary schools.

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Nutrition Management of Type 2 Diabetes Mellitus among Adult Male Patients in Selected Hospitals in Anambra State

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Abstract

The study identified Nutrition Management of Type 2 Diabetes Mellitus among Adult male patients in selected Hospitals in Anambra state, Nigeria. Specifically, the study assessed the perceived causes of Type 2 Diabetes mellitus, awareness of the importance of proper nutrition for the management of diabetes mellitus and the challenges and benefits of adopting proper nutrition. The research adopted a survey research design. One hundred and fifty diabetic patients were selected from three government hospitals by simple random sampling. A structured questionnaire with 25 identified items was used for data collection. The instrument was validated by three experts. Data collected were analyzed using the simple percentage method. Results show that perceived causes of type 2 diabetes include; too much consumption of confectioneries (70.3%), eating too much starchy food (62.5%), and refined foods (51.6%), and it is usually inherited (54.7%). More than half (66.75) of the respondents knew about proper nutrition from dietitians/nutritionists, 26.7% got to know from a doctor while a few (6.6%) got to know from nurses. (40%) of the respondents stated that they believe prayer can heal them, 38.6 % stated that the foods are costly, 36.6% said that they don't have time to prepare food, while 33.3% stated that the kind job can be a hindrance, 30.6% respondents don't like the way the foods are being prepared, while 29.3% stated that they don't know about the proper nutrition, 26% of the respondents stated that the food is not always available, 25.4% said that don't like some of the foods, while 20.6% stated that culture forbids most of the foods, it is difficult to maintain, 20.0% complained that some of them are seasonal and cannot be easily preserved. The findings of the study revealed that proper nutrition has been very helpful for those patients who practice it. It is recommended that family members should pay attention to the proper nutrition of the adult male that is suffering from type 2 diabetes mellitus to ensure adequate nutrient intake. The study, therefore, concluded that for an adult male to live long, he requires to manage his condition with proper nutrition.

Key Words: Nutrition Management, Type 2 Diabetes Mellitus, Adult Male,

Introduction

Scientific evidence abounds to show that the prevalence of diabetes mellitus is increasing around the world at a rate

that appears dramatic as to have been characterized as an epidemic (San Diego, 2013). According to Adams (2017), diabetes mellitus is a metabolic

disorder in which the ability to utilize the primary fuel (glucose) is more or less lost, thus affecting the metabolism of other energy nutrients; fat and proteins. Glucose accumulates in the blood and is lost in the urine, causing excessive urination, thirst and hunger, and, over time, multiple system complications. There are several forms of diabetes mellitus, all characterized by a failure to maintain the concentration of blood glucose within the normal range. The most prevalent type of diabetes is type 2 known as non-insulin dependent diabetes mellitus (NIDDM) and occurs when the body fails to respond to insulin in the normal way.

Globally, an estimated 422 million adults were living with diabetes in 2014, compared to 108 million in 1980. The global prevalence (age-standardized) of diabetes has nearly doubled since 1980, rising from 4.7% to 8.5% in the adult population. The number of cases of diabetes is currently estimated to be around 150 million worldwide, and that number is expected to double by 2025. According to WHO (2021), diabetes caused 1.5 million deaths in 2012; higher-than-optimal blood glucose caused an additional 2.2 million deaths, by increasing the risks of cardiovascular and other diseases; forty-three cent of these 3.7 million deaths occur nearly entirely among adults less than 65 years of age (WHO, 2021).

Over the past decade, diabetes prevalence has risen faster in low- and middle-income countries than in high-income countries. Unfortunately, in many of the lower-income societies, there is a lack of effective policies to create supportive environments for healthy lifestyles and a lack of access to quality health care. As a result, the

prevention and treatment of diabetes, particularly for people of modest means, are not being pursued (World Health Organization [WHO], 2021).

When diabetes is uncontrolled, it has severe consequences for health and well-being. Diabetes can lead to serious complications including blindness, kidney failure, heart disease, and strokes (Eze & Njoku, 2018). Globally, the associated complications with their corresponding morbidity and mortality rates have been reported by Oliveria (2016) as follows: neuropathy (36.2%), nephropathy (24.4%), retinopathy (20.2%), macrovascular (10.0%) and microvascular (9.2%). In addition, diabetes and its complications impact harshly on the finances of individuals and their families, and the economies of nations. People with diabetes who depend on life-saving insulin, pay the ultimate price when access to affordable insulin is lacking. To address this growing health challenge, world leaders have since early this decade committed to reducing the burden of diabetes as one of four priority non-communicable diseases (NCDs) WHO (2021). As part of the 2030 agenda for sustainable development, member states have set an ambitious target to reduce premature mortality from NCDs including diabetes, by one-third, achieve universal health coverage, and provide access to affordable essential medicines (WHO, 2021).

Among several factors that have been found to contribute to the diabetes mellitus epidemic, environmental factors have drawn particular attention because of the rapidity of the increase in type 2 or the so-called 'maturity-onset diabetes mellitus (Seike et al., 2019). Type II diabetes mellitus is closely

related to lifestyle factors including diet, physical activities, alcohol and smoking as well as obesity and a family history of diabetes (Mahler, 2016). Type II diabetes mellitus often goes hand in hand with being overweight (Garrow et al., 2017). Sedentary lifestyles also increase the risk of type 2 diabetes, especially with the presence of excess abdominal fat. Eze and Njoku (2018) noted that consumption of saturated fats may increase the risk of developing type 2 diabetes as opposed to the consumption of sufficient fibre from fruits, vegetables, and whole grain cereals.

Most men with diabetes mellitus have no idea of how to manage their illness effectively. They have various perceptions about the causes of diabetes. Some attribute diabetes mellitus to witchcraft, hereditary, diets and so on. While others are ignorant of the causes of diabetes mellitus and this ignorance about their illness results in mismanagement which may ultimately lead to death. Living with diabetes mellitus requires knowledge and effective management (Uddin et al., 2011). Management of diabetes involves measuring and recording blood glucose levels, eating an adequate diet and involving in regular exercise (Walker, 2015), in addition, to the strong cooperation between patients and doctors. Doctors, Nurses and Dieticians/Nutritionists are essential in the successful management of diabetes mellitus. Often, the primary health care doctor makes the initial diagnosis of diabetes and provides the basic information to the patient on the management programme using drugs then a dietician/nutritionist helps the

patients with the proper diet to manage the disease.

Diabetes mellitus remains a universal and significant health problem, despite enormous research undertakings. Its management requires a multidisciplinary healthcare approach, which includes a combination of diet, insulin therapy, exercise and behaviour modification, to ensure long-term results (Fadupin et al., 2014). In the case of type 2 diabetes, nutritional adjustments are important in preventing and managing the disease. The relationship between nutrition and health cannot be over-emphasized. Good nutrition enhances the body's immunity against diseases. This reflects an increase in associated risk factors such as being overweight or obese.

Diabetes mellitus is a serious and life-deteriorating disease whose causes are strongly correlated with nutritional habits and practices. Many men in present-day Nigeria including Anambra state might be at risk of diabetes mellitus as a result of changes in diet and dietary pattern, and lifestyle. A lot of men work away from home and as a result, depending on food vendors, restaurants and refined meals to satisfy their hunger. This may affect their nutrient intake and could interact with other lifestyle practices to predispose them to the risk of type 2 diabetes. The researcher, therefore, wishes to investigate the usefulness of nutrition in the management of type 2 diabetes mellitus.

Purpose of the Study

The main purpose of this study is to analyze the role of nutrition in the management of diabetes mellitus in

adult males. Specifically, the study determined the;

1. perceived causes of diabetes mellitus;
2. awareness of the importance of proper nutrition for the management of diabetes mellitus, and
3. challenges and benefits of adopting proper nutrition

Methodology

Design of the study: This study adopted a survey research design.

Population for the study: The population for this study was one hundred and fifty-two (150) men. This comprised sixty-five (65) diabetic outpatients visiting NAUTH Nnewi, forty-five (45) diabetic patients visiting General Hospital Onitsha and forty (40) diabetic patients visiting General Hospital Amaku Awka (Sources: Hospital Administrative Director (D, A) Hospitals statistics and Records).

Sample for the study: All 150 patients diagnosed with type 2 diabetes were used for the study as the number was manageable.

The instrument for Data Collection: A structured questionnaire was used to elicit information from adult male patients. The questionnaire was divided into three sections, section one sought data on the perceived causes of diabetes mellitus, section two contained items on awareness of the importance of proper nutrition for the management of diabetes mellitus and section 3 obtained data on the challenges and benefits of adopting proper nutrition. Sections one and three used frequency and percentage rating scales while section 2 used the 'Yes' and 'No' rating scales.

Validation and reliability test: Three experts from Home Economics and Hospitality Management Education validated the instrument. The instrument was subjected to trial testing in two private hospitals in the area of the study to test its reliability of the instrument. A Cronbach alpha value of 0.82 was obtained, hence, this indicated that the instrument was reliable.

Ethical Clearance and informed consent: Ethical approval for the study was obtained from the chief medical directors of the hospitals. Informed consent was obtained from the patients using a form. The researcher explained to the participants the purpose of the study and the confidentiality of the data obtained before they signed the form.

Method of Data Collection: One hundred and fifty (150) copies of the questionnaire were distributed to adult male patients with type 2 diabetes by 3 research assistants. Efforts were made to ensure that the items were filled correctly without omitting any needed information. One hundred and fifty (150) of the distributed questionnaires were returned.

Data and Statistical Analysis: Information obtained from the questionnaire were coded and analyzed using the computer software, statistical product and service solution (IBM-SPSS) for windows, version 20. The data obtained from the questionnaire were analysed using frequency and percentages. All responses that had up to 50% response were accepted as a factor.

Results

Perceived causes of type 2 diabetes mellitus

In table 1 below, a greater proportion of the respondents perceived the causes of type 2 diabetes mellitus to include; consuming too much confectioneries (70.3%), eating too many starchy foods

(62.5%), too much glucose from the liver (56.8%), diabetes is usually inherited (54.7%), comorbid of hypertension (53.1%), and eating refined food (51.6%). Other lesser perceived causes are physical inactivity (46.9%) and obesity (41.1%).

Table 1: Perceived causes of type 2 diabetes mellitus

Causes of type 2 diabetes	Frequency	Percentage
It is usually inherited	105	54.7%
Taking soft drinks daily can cause the disease	25	13.0%
Too much glucose from the liver	109	56.8%
It is common for those to eat starchy food	120	62.5%
Smoking can cause type 2 diabetes	30	15.6%
It is common for an adult male to eat refined foods	99	51.6%
Common in those with hypertension	102	53.0%
It is associated with inactivity	90	46.9%
Too much consumption of confectioneries can cause the disease	135	70.3%
It can be caused by overweight	50	26.0%
Obesity can lead to type 2 diabetes	79	41.1%
Intake of too many alcoholic drinks can cause diabetes	30	15.6%

Awareness of the importance of proper nutrition in the management of diabetes mellitus

In Table 2, it was observed that all the respondents are aware of the importance of proper diet for the management of diabetes mellitus. Data showed that the majority (66.7%) of the

respondents get to know about the importance of proper nutrition in the management of diabetes mellitus from dietitians/nutritionists, 26.7% from the doctor and a few (6.6%) got to know from nurses.

Table 2: Percentage Responses of the respondents on awareness of the importance of proper nutrition for the management of diabetes mellitus

Items	Yes F (%)	No F (%)	Total
Are you aware of the importance of proper diet for the management of type 2 diabetes mellitus	150 (100)	0 (0)	150 (100)
Sources of information			
From my doctor	40 (26.7)	110 (73.3)	150 (100)
From Dietitian/Nutritionist	100 (66.7)	50 (33.3)	150 (100)
From Nurses	10 (6.6)	140 (93.4)	150 (100)
Through mass media	0 (0)	150 (100)	150 (100)
From friends /relations	0 (0)	150 (100)	150 (100)
Through workshop/campaign	0 (0)	150 (100)	150 (100)

Challenges and benefits of adopting proper nutrition for the management of diabetes mellitus

As observed from Table 3, more than half of the respondents did not consider it challenging to adopt the nutritional management of diabetes. Less than half (40%) of the respondents stated that they believe prayer can heal them, 38.6% stated that the foods are costly, 36.6% said that they don't have time to prepare food, while 33.3% stated that the kind of job can be a hindrance, 30.6% respondents don't like the way the foods are being prepared, while

29.3% stated that they don't know about the proper nutrition, 26% of the respondents stated that the food is not always available, 25.4% said that don't like some of the foods, while 20.6% stated that culture forbids most of the foods, it is difficult to maintain, 20.0% complained that some of them are seasonal and cannot be easily preserved. It is also observed that the practice of proper nutrition is very helpful by a high percentage of the respondents (83.3%), while moderately helpful is slightly above 16%.

Table 3: Percentage Responses of the respondents on challenges and benefits of adopting proper nutrition for the management of diabetes mellitus

Items	Frequency	Percentage (%)
Challenges		
The foods are costly	58	38.6
They believe prayer can heal them	60	40.0
The foods are not always available	40	26.0
They don't have time to prepare the food	55	36.6
The kind of job can be a hindrance	50	33.3
Culture forbids most the foods	30	20.6
They don't think it is necessary	29	19.3
It is difficult to maintain	31	20.6
They don't like some of the foods	38	25.4
Some of the foods are seasonal and cannot be easily preserved	30	20.0
They were not properly advised	40	26.6
They don't like the way the food is being prepared	46	30.6
How beneficial is the information about nutritional management of diabetes?		
Not beneficial	0	0
Moderately helpful	20	16.7
Very much helpful	100	83.3

Discussion

The findings of this study showed that the perceived causes of diabetes mellitus among the respondents were too much consumption of

confectioneries and starchy foods, glucose from the liver, genetics, comorbid of hypertension, and eating refined foods. Carbohydrate metabolism develops type 2 diabetes

which occurs when the body can not properly use the insulin it makes. When one consumes carbohydrates, the digestive system breaks down the digestible ones into sugar, which enters the blood. As the blood sugar levels rise, the pancreas produces insulin, a hormone that prompts cells to absorb blood sugar for energy or storage. This is in line with the findings of Ukegbu et al. (2013). Olatona et al. (2019) also observed that consumption of alcohol, processed cereals and obesity were linked to type 2 diabetes. Asimwe et al. (2020) also confirmed that high blood pressure (hypertension), high body mass index (overweight and obese), smoking, alcoholism, and family history were significantly related to being diabetic. This study also found that the presence of a family history of diabetes, being overweight and being obese and ill feeding by adult males increase the chances of acquiring type 2 diabetes.

The finding of this study also showed that all the respondents are aware of the importance of proper nutrition in the management of diabetes mellitus. The majority of them got the information from dieticians and nutritionists; some were informed by doctors while a few got the information from nurses. There is widespread awareness of diabetes mellitus among adult males due to adequate awareness education among health workers. This is in line with the observation of Kiren et al. (2017) which showed that the majority of the participants heard about adequate diet for diabetic patients and its importance in managing diabetes mellitus.

A further finding of the study showed that the majority of the respondents did not find it challenging

to follow the proper nutritional guidelines for managing diabetes. Hence most of them found that adopting the recommended diet was beneficial to them. However, some of them reported that they preferred to handle their problems through prayers. This is because of the belief pattern of the average African where he sees everything from a spiritual point of view, and as such might be unwilling to explore other non-spiritual remedies. Others stated that the recommended foods were usually costly and some did not have the time to prepare the special meals as a result of their job demands. Some of these men could not afford the special diets. Some others did not like special foods or the way they are being prepared since they are not used to such meals. This is in agreement with (Jessica et al., 2020) who stated that the foods environment limited participants' access to healthy foods, understanding of diabetes and communication with clinicians about healthy eating was limited, the stress in large part from poverty, were seen as factors for both poor eating and diabetes.

Conclusion

Diabetes mellitus is one of the major health problems of an adult male which often results in morbidity and mortality from complications. Perceived causes of type 2 diabetes include too much consumption of confectioneries and starchy foods, glucose from the liver, genetics, a co-morbid of hypertension, and eating refined foods. All the respondents were properly informed of the importance of proper nutrition in the management of diabetes mellitus, by nutritionists, doctors and nurses. A good number of them also adhere to

proper nutrition which they find beneficial to their health. However, some of them could not adopt adequate nutritional management as a result of religious beliefs, insufficient time to prepare the meals as well as dislike and lack of money to buy the recommended foods.

Recommendations

Based on the findings of the study, the following recommendations were made:

1. Improvement and advancement of education programs on media are emphasized to sensitize the public about the burden and complications of type 2 diabetes should be emphasized.
2. The government (Ministry of Health) should design and implement a strategy for early diagnosis and an appropriate population-based nutrition management programme which should be a public health and economic priority.
3. The government (Ministry of Health) should enlighten diabetic patients on the risk factors of diabetes mellitus and its nutritional management, especially in hypertension, high BMI and faulty eating habits should be mounted.

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Relationship between Parents' Play Belief and Social Skill Development of School-Aged Children (6-12 Years) in Enugu East Local Government

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Abstract

This study assessed the relationship between parents' play beliefs and the social skills of their school-aged children (6-12 years) in Enugu East local government. A descriptive cross-sectional survey design was employed in a population of 60,676 pupils (39,455 private and 21,221 public). Multi-stage sampling was employed in the selection of 1,165 pupils from 12 schools whose parents formed the sample size/respondents. The study was guided by three research questions and three null hypotheses tested at $p < 0.05$ level of significance. Parents' Play Belief Scale (PPBS), and Social Skills Rating System (SSRS) were instruments used for data collection. The reliability of the instrument was ascertained using Cronbach's alpha reliability index. Data obtained were analyzed using descriptive statistics (frequencies, percentages, mean and standard deviation) and inferential statistics (Pearson's product-moment correlation, and T-test), and presented in form of tables and charts. A majority (95.3%) of the respondents showed strong parental play beliefs. A greater percentage (46.6%) of the parents reported that their children showed high social skills. A positive significant relationship was seen to exist between parents' play beliefs and the social skills status of their children ($r = .104^{**}$, $p < 0.05$). The mean play belief score of parents with female pupils was not significantly different from the males. Parental play belief scores of children in private schools (80.5 ± 10.33) did not significantly vary from those in public schools (80.55 ± 10.58) $p < 0.05$. The social skills status of children in private schools ($29.29 \pm$) however, was higher than those in public schools (30.14 ± 6.84). Schools should, therefore, devise ways of improving the social skill development of their school-age children.

Keywords: Parents, Play-belief, social skills, school-aged, Enugu-east

Introduction

Play is a primary concept in early childhood development. Play is an important component of childhood learning and development (Fisher *et al.*, 2011). Children have an unconstrained view of play and they are seeing opportunities to play almost anywhere

and with almost anyone (Glennet *al*, 2013). Children explore and understand their environment, express various kinds of emotions, acquire skills including problem-solving, and social skills and learn how to cooperate with others through play. Vygotsky, Baumrind and Piaget stated the

importance of play for a child's development. According to these theorists children learn through active interaction with their parents and their environment, which is facilitated through play. Parents are the first socializing adults and their active participation in their child's play aids in the cognitive, language, social skill, fine motor, gross motor and academic development of the child (Singh & Gupta, 2012). As parents are the first role model, children can be able to learn basic skills with their parent's participation in their play and become healthy adults. Parent beliefs and attitudes towards play are heterogeneous across cultures and societies. This is supported by Fogle and Mendez (2006) who opined that parents, who view play as a priority and see play as a teaching opportunity for their children, have high levels of play support. Parents' beliefs and attitudes have a great influence on children's active play behaviour and specifically their social skill development (Loprinzi & Trost, 2010).

Developments of social skills started at home through interaction with parents. The child enters preschool as the first social environment and continues the process of socialization. According to Bandura (1997), children's growth is dependent on the social learning opportunities afforded at home through modelling, reinforcement, and imitation. The same can be said of the social skills development of children. According to Whitcomb and Merrell (2013), social skills are said to be specific behaviours that assist the child to accomplish his or her daily social tasks. These social skills are life skills (United Nations International Children's

Emergency Fund [UNICEF], 2012) and vital for children's development. Social skills are a collection of learned behaviours giving individuals the ability to have an influential relationship with others and to abstain from socially unreasonable reactions (Agran et al., 2016; Davies et al., 2015; Gresham, 2016; Yoder, 2015). Social skills are skills used to communicate and interact with each other both verbally and non-verbally, through gestures, body language and personal appearance (Takahashi et al., 2015). Social skills are learned and affected by the characteristics of the context in which they develop (Sørli et al., 2021). Hosokawa and Katsura (2017) stated that social skills can also be acquired for effective performance, adaption and improvement in quality of life.

Socially skilled children often have more positive attitudes toward school, adjust more smoothly to the student role, and have better grades than their less socially skilled peers (Hamre & Pianta, 2001; Zsolnai, 2002). This supports other studies which reveal that social skills are associated with academic achievement (Alexander et al., 2003; Ladd et al., 1999). Children with good social skills are more successful than their less competent peers in developing positive attitudes towards school and in adjusting to school (Hamre & Pianta, 2001; Odom et al., 2006; Semrud-Clikeman, 2007). Social skills are more learned in school-age children because their brains are ready to assimilate, understand the importance of social skills and communicate effectively with their peers.

School age is one of the developmental stages under early

childhood which includes children between 6 to 12 years. They look for ways to demonstrate new skills, control their behaviour, make independent decisions and form good social relationships with peers and others outside the family. At this stage children, develop social skills on how to solve their problems, progress academically and learn to convey their desires and feelings. Children at this stage are introduced to new social roles, status, competence and performance through formal education and organized activities. Children's learning of social skills is an important springboard for their future social development, with benefits in various fields of life. Improving social skills is important for the development of school-age children since improving these skills helps them to become better relationship builders.

Parents usually have preconceived ideas of the child's play behaviours and inclinations based on their gender. This influences their role as parents. For instance, parents will typically provide their male children with toy guns, trucks and superhero play materials which mostly promote solitary play and motor skills. The female children on the other hand are mostly provided with dolls and dress-up costumes that promote role play, social status and nurturing. Parental beliefs and perceptions are strong predictors of parental involvement in children's school activities. Parental involvement is to an extent enhanced by the child's school. Most private schools create an opportunity for parents to participate in the education and social activities of their children. Such opportunities include inter-house sports competitions, end-of-year parties and parents

teachers' forum meetings. These opportunities provided by schools could invariably interact with the beliefs and attitudes parents have towards the children's play activities.

Theoretical Background

This study assessed the relationship between parents' play beliefs and the social skill development of school-aged children using the social constructivist theory by Lev Vygotsky. According to this theory, individuals' thoughts and behaviours are moulded by perceptions of the reality around them (Berger & Luckmann, 1966) and they gain insight through interactions with people. This suggests that people construct their understanding and knowledge of the world through their experiences and how they reflect upon them. One of the core constructs of Vygotsky's theory of social constructivism is the zone of proximal development (ZPD), which emphasizes the role of the instructor in an individual's learning. The ZPD suggests that, with the help of an instructor, students are able to understand and master knowledge and skills that they would not be able to on their own (Schreiber & Valle, 2013). Vygotsky emphasized social interaction, which is also relevant to parents' understanding of the best environment for their children. He furthermore implied that parents form an understanding of what constitutes a suitable educational environment for their child based on their expectations, which have been informed by their repertoire of experiences. Constructivism is based on three assumptions about learning (Steffe & Gale, 1995). First, learning is a result of the individual's interaction with the

environment. This implies that knowledge is constructed as the learner makes sense of their experiences in the world. The second assumption is on cognitive dissonance which suggests that the uncomfortable tension that comes from holding two conflicting thoughts at the same time, is the stimulus for learning. Thirdly, the social environment plays a critical role in the development of knowledge. This study thus, leaning on the constructivist perspective, this study postulates that parents who have positive beliefs and attitudes towards children's play are more like to provide a supportive and stimulating play environment for their children at home. This in turn is expected to enhance children's engagement in constructive play and therefore improve their social interaction with their peers.

Objectives of the Study: The broad objective of the study was to evaluate the relationship between parents' play beliefs and social skills development of school-aged children (6-12 Years) in Enugu East Local Government. Specifically, the study sought to:

- ascertain parents' play belief in Enugu East L.G.A
- determine parents' perspective of the social skill status of school-aged children in Enugu East L.G.A
- determine the relationship between parents' play belief and social skills status of school-aged children in Enugu East L.G.A

Hypotheses

The study tested the following null hypotheses:

1. There is no significant difference in the mean parents' play belief scores based on gender, type of school and child's level in school.
2. There is no significant difference in the mean social skills scores of the children based on gender, type of school and child's level in school.
3. Parental belief is positively correlated with children's social skills.

Methodology

Study Design: Descriptive cross-sectional research design was adopted for the study.

Study Population: The population of the study consisted of parents/guardians of 60,676 primary school pupils in the 110 primary schools in Enugu-East Local Government Area in Enugu State, Nigeria. The parents of the selected pupils formed the respondents for the study.

Sampling/ Sample Size Determination: Sampling was done in multi-stages; the first stage involved cluster sampling of the schools into the rural and urban clusters. The cluster was further divided into private and public sub-clusters. The second stage involved simple random sampling without the replacement of 10% of schools in the clusters. This gave a total of 2 schools from the rural-public cluster, 4 from the urban-public cluster, 4 from the rural-private cluster, and 2 schools from the urban-private cluster. This gave a total of 12 schools. The WHO (2013) formula for sample size was adopted. This gave a total sample size of 1,165. The final Stage involved a random selection of children who were given copies of the questionnaire for their parents.

Instrument of Data Collection: Two instruments were employed for data collection and they include: The parent's Play Belief Scale (PPBS; Fogle & Mendez, 2006) and the Brazilian version of parents' version of the (SSRS; Gresham & Elliott, 1990). The PPBS is a 30-item parent questionnaire that is rated on a 5-point scale from 1 (disagree) to 5 (strongly agree). It has two sub-scales: play support belief and academic focus. Some of the questions include 'Through play, my child develops new skills and abilities' and 'reading to my child is more worthwhile than playing with him or her.'

The Brazilian version of the parent's version of the (SSRS; Gresham & Elliott, 1990) was adapted and used to assess the parents' perspective of their children's social skills. Some of the items include 'my child keeps the room clean and neat,' and 'he/she completes household tasks within a reasonable time. The scale contains five subscales; responsibility consists of 5 items, and self-control is made up of 5 items amongst others. Items were rated based on the frequency with which they occur (0 = never, 1 = sometimes, 2 = very often).

Validity and reliability of the instrument: The reliability of the instruments for the study was ascertained using Cronbach's alpha reliability test. Coefficient scores were 0.71 for the Parent's play belief Scale (PPBS), and 0.66 for Social Skills Improvement System Rating Scales. These values fell within the acceptability range of 0.65 and 0.90 as stated by Goforth (2015).

Method of Data Collection: Data were collected using a questionnaire. A total of 1,165 questionnaires were shared by

trained research assistants to parents of the selected children after written consent was obtained from them. Three trained research assistants gave the printed questionnaire to parents who came to pick up their children. For children whose parents did not come to pick them up from school, the questionnaire copies were put in their bags with a written note for their parents. Parents were asked to fill out the questionnaire and return it to the teacher the next day. The research assistants then collected the returned questionnaire from the teacher. A total of 1,042 questionnaires were retrieved with a return rate of 89.4%.

Data and Statistical Analysis: the collected data were sorted and cleaned from errors and missing information. Data were then coded and entered into the computer software statistical Product for the Social Sciences (IBM - SPSS) version 21.0 and presented as means and standard deviation. Pearson's correlation was used to ascertain the relationship between Parents' play beliefs and the social skills status of school-aged children. T-test was used to test the null hypotheses at a significance level of $p < 0.05$. Scores on parents' play belief were summed and a total mean score within (25-63) was considered weak parental belief while scores within (64-125) were considered strong parental play belief. A total mean score of (17-43) was considered weak play support and 44-85 was considered strong play support. A mean score of (8-20) was considered a weak parental academic play focus and (21-40) was considered a strong academic play focus. The decision rule was placed at mean ≥ 3.0 as agreed.

The Brazilian version of parents' version of the (SSRS; Gresham & Elliott, 1990) subscale of responsibility and self-control had a score range of 0 to 10 each, cooperation/assertiveness; a score range of 0 to 14, social confidence and civility; a score range of 0 to 8 each. The total social skills score was calculated by summing up all sub-scale scores with a range of 0 to 50. The scores in each subscale and the total social skill score were categorized into low, moderate, or high. Scores within one standard deviation of the mean (29.6 ± 6.9) indicated a moderate level. Scores below or above one standard deviation of the mean category fell into the low or high levels, respectively

Result

Socio-demographic Characteristics of the Respondents

Many 51.7%) of parents had their children in private school while 40.8% were in public school. The respondents' children were 40.5% male and 59.5%

female children. Many (57.8%) of the parents were within 31-49 years and a few (13.1%) were 50 years and above. More than half (55.3%) of them had their children in primary 4-5, 23.0% in primary 5-6 and 21.1% in primary 1-3.

Parents' Play Belief

Table 1 below shows the frequency and percentage scores of the parents on different categories of play belief. From the table, the majority (95.3%) of the respondent in the study showed strong parental play belief while 4.7% had weak parental play belief. The result on the two dimensions of parental play belief (Parental play support and parental academic play focus) showed that 91.7% of the respondents had strong parental play support while (8.3%) had weak parental play support. Furthermore, (84.5%) of respondents had a strong parental academic play focus while the least (15.5%) had a weak academic play focus.

Table 1: Frequency and percentage scores of Parents Play Belief

	Weak F (%)	Strong F (%)	Total N (%)
Parental play belief	49 (4.7)	993 (95.3)	1,042 (100)
Parental play support	86 (8.3)	956 (91.7)	1,042 (100)
Parental academic play focus	161 (15.5)	881 (84.5)	1,042 (100)

Social Skills Status of the Children

Table 2 below shows the frequency and percentages scores of the respondent's perception of their child's social skills. From the table, 46.6% of the parents reported that their children showed high social skills while 45.9% reported low social skills. The table also showed data on the dimensions of social skill; responsibility, self-control, social confidence, assertiveness/cooperation and civility. More than half (51.1%) of

the parents reported high civility in their children, while 17.6% reported low civility. About 49.8% reported that their children had high social confidence while 17.2% reported low social confidence. A greater percentage (49.3%) rated their children high on self-control while 24.9% rated their children low on self-control. Data further showed 45.2% rated their children low on responsibility, 39.2% rated high responsibility, 42.2% rated low

cooperation and 41.5% reported high | cooperation.

Table 2: Frequency and percentage scores of on Social skill status of school-aged children

Social Skills Status	Low F(%)	Moderate F(%)	High F(%)	Total F(%)
Social Skills	478(45.9)	78(7.5)	486(46.6)	1,042(100)
Categories of Social Skill				
Civility	183(17.6)	327(31.4)	532(51.1)	1,042(100)
Social Confidence	179(17.2)	344(33.0)	519(49.8)	1,042(100)
Self-Control	259(24.9)	269(25.8)	514(49.3)	1,042(100)
Responsibility	471(45.2)	163(15.6)	408(39.2)	1,042(100)
Assertiveness/Cooperation	440(42.2)	170(16.3)	432(41.5)	1,042(100)

Hypothesis 1: There is no significant difference in the mean parents' play belief scores based on gender and type of school.

Table 3 revealed that the parent's play belief mean score for their female children (80.55) was not significantly different from those of the male

children (80.63), $p>0.05$. The table also shows that the mean parents' belief scores of children in private schools (80.59) were not significantly different from those in public schools (80.57), at $p<0.05$. This implies that parents' play belief is not dependent on gender and the type of school the child attends. The null hypothesis was, therefore, upheld.

Table 3: Mean difference in the Parents' play belief score based on gender and type of school

Variables	Parental belief	play	Mean	Standard Deviation	t- value	p- value	df
Gender of the child	Male		80.63	11.24	13	.90	857
	Female		80.55	10.58			
Type of School	Private		80.59	10.33	.02	.99	1040
	Public		80.57	11.75			

Hypothesis 2: There is no significant difference in the mean social skills scores of the children based on gender and type of school.

Table 4 below shows the mean difference in the social skills of the children based on gender and the type of school the child attends. From the table, the social skills score of the male

children (29.92) was not significantly different from those of the female children (29.44), at $p<0.05$. The social skills of children in private schools (29.29) were significantly different from those in public schools (30.14), at $p<0.05$. The null hypothesis was therefore upheld for gender and rejected for the type of school.

Table 4: Mean difference in the social skills of school-aged children based on gender and type of school

Variables	Social Skills	Mean	Standard Deviation	t-value	p-value	df
Gender of the child	Male	29.92	6.71	1.14	.257	1040
	Female	29.44	6.60			
Type of School	Private	29.29	6.49	-2.03	.043	1040
	Public	30.14	6.85			

Hypothesis 3: Parental belief is positively correlated with children's social skills.

Table 5 shows the relationship between parents' play beliefs and the social skills of school-aged children in Enugu East. From the table, a positive and strong significant relationship was seen to exist between parents' play beliefs and the social skills of their school-aged children ($r = .104^{**}$, $p < 0.05$). This implies that a positive change in parents' play beliefs will bring about a corresponding positive change in the social skills status of school-aged children. The alternative hypothesis was therefore upheld.

Table 5: Relationship between parents' play belief and social skills status of school-aged children

	Parents' play belief	Social Skill
Parent's belief		
Pearson Correlation	1	.104**
Sig. (2-tailed)		.001
Pearson Correlation	.104**	1
Sig. (2-tailed)	.001	

Discussion

The study revealed that respondents showed strong parental play belief as the majority reported providing play support for their children at home. This may be linked to the fact that most of the parents had attained tertiary

education and therefore might have advanced knowledge of the importance of play. Parents with a strong play belief can be said to hold the view that play activities can aid their children in the development of skills in life especially social skills. This is in line with the study by Ihmeideh (2019) which stated that parents who show strong parental play beliefs facilitate and support their children's play at home. This play support may encourage children's physical, cognitive, social, and emotional development (Hughes & Ensor, 2009). Parent belief towards play can be said to be heterogeneous across cultures and societies. For instance, according to Parmar et al. (2004), European American parents see play as key to early growth while Asian parents feel it has little developmental benefit.

According to Fisher et al. (2008) parents' play belief ranges from considering play as an important means of development to simply a form of amusement. In the study play belief was categorized under parental play support and parental academic play focus. Parents had strong parental play support and strong parental academic play focus. This supports the findings of Fogle and Mendez (2006) who reported that respondents had strong parental play support than those that had weak parental play support. This implies that parents' belief in child's play is an important developmental activity for

children, beyond entertainment. Parents with “academic focused” beliefs stress the importance of explicit academic activities, such as reading to the child. They tend to believe that play is a less valuable activity concerning child development (Fisher et al., 2008).

The majority of the children in the study showed high social skills. This may be attributed to the role of the home and school environment as agents of socialization. That is to say that the school and the child’s home environment may have downplayed the role of the child’s personality. This finding may be further explained by Almaraz et al. (2019) who stated that social skills are learned as the child interacts with his environment. The finding of this study is supported by several studies which have shown that family characteristics (e.g. parents’ social competence, parenting style, the nature of the attachment between mother and child, and sibling effects) play a major role in the development of social skills (Cole & Tan, 2007; Denham et al., 2007; DiPrete & Jennings, 2011; Kochanska & Aksan, 2006). Children with well-developed social skills have been seen to readily enter into positive relationships with teachers and peers, which most times, reinforce their social skills. According to Grant (2013), school-aged children high in social skills received more positive performance evaluations when they engaged in voice behaviours than those low in social skills. Thus, school-aged children high in social skills may be perceived as more benevolent and thoughtful of others than those low in social skills. A low responsibility was reported among school-aged children. This could be linked to the mindset that parents in

this generation have. A lot of parents no longer instil a sense of responsibility in the minds of these children as paid caregivers are made to take up some of the duties these children can assist with at home. This finding is contrary to the findings of Ludmila and Olga (2016) who revealed that a low responsibility may be seen in preschoolers and increases to a moderate level in school-aged children.

The findings of this study revealed that the parents’ play belief score for their female children was not significantly different from those of the males. This is in line with a study by Albatataineh (2018) which showed that there was no statistical difference between parents’ play beliefs based on their child’s gender. The study also showed that the mean parents’ belief scores of children in private schools were not significantly different from those in public schools. This implies that the type of school a child attends does not influence the parent’s play beliefs. This finding may be because at the preschool level parents’ concern is on the availability of fun for their children. As children enter the school-age period, the focus on fun diminishes and gives way to preparing for the quality of education available for children and grades. This suggests that age rather than gender or type of school may be an influencer of parents’ play beliefs as their children go through the different developmental stages. This is supported by various researchers who discovered that many preschools and elementary school administrators have reduced or eliminated play from their schedules (Bodrova & Leong, 2003; Brandon, 2002; Sisson, 2011; Vail, 2003).

This study also revealed that the social skill of the male pupils was not significantly different from those of the female children as reported by parents. This implies that parents did not find any difference in how their male and female children interacted with other people. It, therefore, suggests that other factors like personality and environment could be responsible for the social skills development of an individual apart from their gender. The findings of this study contradict those from other studies. For instance, in a study by Abdi (2010) girls were found to have received higher marks in social skills than boys. Several studies have also shown that girls displayed a larger range of social skills than boys, seeking more information about social situations, showing prosocial behaviours, as well as having less pressure to prevent emotional expressions than boys (Berger & Rodkin, 2012; Taylor & Graham, 2007; Torrente et al., 2014). This may be explained by DiPrete and Jennings, (2011) who revealed that schools and teachers mostly provide educational climates that enhance the social behavioural advantage of girls. Entwistle et al. (2007), also saw gender bias by teachers and parents in favour of girls. They argue that girls have better social and behavioural ratings not so much because of differences in maturity but rather because “they find the student role more compatible than boys do”. The social skills of children in private schools were, however, significantly lower than those in public schools. Those in public schools appeared to have better social skills status than those in private schools. This result could be attributed to the nature of play

found in most public schools. Most of the children come from almost the same background and so could easily understand each other. This gives room for them to interact freely. More so, due to the busy work schedule of parents who have children in private schools, it is likely they barely have time to interact with their children which may affect the social skills development of that child. Furthermore, most parents who send their children to private schools might emphasize intellectual development over play, therefore most private schools in a bid to meet the demands of the parents, focus on academic curriculum with little or no time for play. The findings of this study, however, contradict the study by McKinley et al. (2007) which revealed that private-schooled children scored significantly higher than home-schooled children on measures of cooperation, assertion, self-control and overall social skills.

A positive and strong significant relationship was seen to exist between parents’ play beliefs and the social skills of the school-aged children in this study. This implies that parents who have a stronger belief in play were more likely to report higher social skills among their children. Parents’ play belief may influence their attitude towards their children’s play as well as their involvement in their children’s play (parent-child play). Since parents are role models for their children, the child may learn some social skills during parent-child play which may affect the social skills development of the child. The findings of this study corroborate the research by Lin and Yawkey (2014) which revealed an association between parental play

beliefs and their children's social skills even after controlling for the parental background variables associated with children's social competence. Other studies have also shown that parents' play support beliefs were positively associated with their children's interactive play skills (Fogle & Mendez, 2006; LaForett & Mendez, 2016), while parents' academic-focused beliefs were negatively associated with the same set of skills (LaForett & Mendez, 2016).

Conclusion

The majority of the respondents in the study showed strong parental play beliefs. They believed that play helps to get children ready for school and that children feel better when they are engaged in play. The majority of the children in the study were found to have high social skills, based on the perception of their parents. Positive parents' belief in child's play was associated with higher social skills among school-aged children. Parents' beliefs about play and their perception of the social skills of their children did not differ irrespective of the gender of the child, however, children who attended private schools were reported to show higher social skills than those who attended private schools.

Recommendations

The following recommendations were made based on the findings of the study:

1. Parents should encourage outdoor play at home and provide toys for their children to play with as this will help their child develop social skills, cognitive ability and physical development.

2. Teachers should introduce different games during play activities for children to enable them to develop many skills including social skill develop their social skills and generally getting a holistic individual.

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Nutrition Knowledge, Attitude, and Childcare Practices of Mothers in Kaduna South Local Government Area, Kaduna State

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Abstract

Nutrition significantly impacts the different areas of human development. Appropriate nutritional knowledge, attitude, and practices are necessary to achieve a proper outcome of infant and young child feeding. This study assessed the nutrition knowledge, attitude, infant and young child feeding and childcare practices of mothers in Kaduna South Local Government Area, Kaduna State. A descriptive cross-sectional survey design was employed. A sample size of 130 women of childbearing age that visited health centres in Kaduna South was selected using a multi-stage sampling method. Data were collected with a pre-validated questionnaire. Data were analyzed with the statistical product for service solution (SPSS) version 21 using descriptive statistics. The majority (94%) of the mothers had excellent nutrition knowledge and more than half of the mothers (62.3%) had a good nutrition attitude score. About one-quarter of the mothers had poor knowledge of nutrition, attitude and childcare practice. A significant relationship existed between respondents' occupation and their nutrition knowledge, attitude and practice ($p < 0.05$). More so, a positive significant relationship was observed among nutrition knowledge, attitude and child-feeding practices of the mothers ($p < 0.05$). The study concludes that many of the mothers had good knowledge and favourable attitude and practices towards young children's nutrition and care. However, more awareness should be created by nutritionists on the importance of good infant and young child feeding practices as well as childcare practices should be undertaken.

Keywords: Nutritional knowledge, Attitude, Childcare practices, Mothers

Introduction

There is an evident impact of nutrition on the health and development of humans throughout their life course. This impact is mostly observed in early childhood in the aspects of cognitive and social development (Black et al., 2013). Therefore, nutrition is an important factor in healthy

development in childhood. The growth and immune status of children can be compromised by inadequate nutrition, which can lead to recurrent and increasingly severe infectious diseases (Kapantais et al., 2011). At the household level, the nutritional status of a child is affected by the household's ability to provide adequate food in

quality and quantity, the mother's pattern of child upbringing and knowledge of nutrition and other sociocultural factors (Dessie et al., 2019). Every time a child suffers the scourge of malnutrition, the responsibility goes to the mother, the family and the community. This is usually due to a lack of knowledge regarding the harmful effects of pre-lacteal feeding, the benefits of exclusive breastfeeding, timely initiation of complementary feeding and dietary practices. The mothers, however, bear the majority of the responsibilities. Good nutritional knowledge will enable mothers to easily apply them to their households thereby creating a healthy generation in which children can grow and develop optimally (Agho et al., 2011).

Nutrition knowledge refers to an individual's understanding of nutrition, including the intellectual ability to remember and recall food and nutrition-related terminology, specific pieces of information and facts (Food Agricultural Organization [FAO], 2014). Mothers are the foremost providers of primary care for children. Their understanding of basic nutrition and health measures strongly influences the care they provide. The mother's level of education has a positive impact on her knowledge and how she deals with childcare issues (Ibrahim, 2010). A good knowledge of nutrition will encourage a mother to provide good feeding patterns for her children. Family nutrition to an extent is affected by the application of the mother's nutrition knowledge. Several studies in Nigeria have shown that mothers of childbearing age have good nutrition knowledge of infant and young child feeding (Alemayehu & Tesema, 2016; Ojiugo, 2010; Kever, et al.

2015). Nutritional knowledge, attitude, and childcare practices of caregivers are vital determiners of the outcomes of complementary feeding regimes administered to children (Saha et al., 2008; Turyashemerwa, 2009). Attitude is defined as the emotional, motivational, perceptive, and cognitive belief that positively or negatively influences the behaviour or practice of a caregiver toward complementary feeding (FAO, 2014) and proper childcare practices. Attitude may be a predictor of practice. Therefore, the Nutritional attitude of mothers is required to improve children feeding patterns for optimal child health and development.

Childcare practices refer to the quality, quantity, diversity and availability of health care services given to a child which must not be necessary from the health services providers and parents but from other older adults (Sanders, 2009). Childcare practices are always part of a system of care that covers the whole cycle of childbearing and childrearing in the family. According to WHO (2013), childcare practices are the physical, social, and health care given to a child (World Health Organization, 2013). Child care practices include exclusive breastfeeding or other forms of breastfeeding, complementary feeding, hygiene, immunizations, micronutrients, use of bed nets for malaria prevention, psychosocial development, compliance with medical/health advice, antenatal care, home care for illness, home treatment of minor infections and care-seeking practices (World Bank, 2012; United Nations Children's Fund, 2011). According to Qayyum et al. (2015) childcare practices should focus on

feeding, sleeping, and toileting, among other things. Very young children depend on adults for care and protection. This includes providing safe sleep environments (Davis et al., 2004). Studies have shown that alongside nutrition and exercise, sleep is a principal factor of health that affects daily functioning and life-long well-being (Galland et al., 2012; Wong et al., 2013). In early childhood foundation for sleep, and development is laid and sleep patterns are increasingly sensitive to the environment (Touchette et al., 2013). It can be difficult for children to get to sleep if they are not feeling safe and secure, have just been very active, a lot is going on around them, or if their sleep and rest times vary a lot from day to day. Therefore, good sleep practice is paramount.

Toilet use is one of the early childhood developmental milestones (Baird et al., 2019). Parents are caregivers are saddled with that responsibility. Parents, however, find toilet training to be a stressful process; there are a variety of different training methods to choose from, with little evidence of the best approach, and complications can arise for the child such as stool toileting refusal, hiding to defaecate, and nighttime bedwetting (Baird et al., 2019; Kiddoo, 2012; Vermandel et al., 2008). Failure of toilet training may result in significant physical and psychological consequences like a sense of failure through partial loss of autonomy (Kinservik & Friedhoff, 2000). Play, one of the childcare practices is an important part of a child's early development. This is because playing helps young children's brains to develop and their language and

communication skills to mature. Lack of play and communication, known as "under-stimulation", can have long-term negative consequences on a child's learning and physical and mental health. Appropriate feeding practices during childhood, especially in the preschool years, are important for maintaining proper nutrition, health, and development of children (Saha et al., 2008). Feeding practice is defined as the observable actions of the caregiver that could affect the nutrition of the child undergoing complementary feeding such as eating, feeding, washing hands, cooking, and selecting foods (FAO, 2014). Poor infant feeding practices coupled with high rates of infectious diseases are the major causes of malnutrition during the first two years of life (Demowozet et al., 2015). In developing countries, under-nutrition-related diseases account for more than 1/3 of under-five mortality (Daelmans et al., 2013; Mesfin et al., 2015). To a large extent, this situation has been attributed to inappropriate complementary feeding practices by caregivers who in most cases lack adequate nutrition knowledge and information (Khanal et al., 2013; Shi & Zhang, 2011).

Child undernutrition has remained one of the main public health problems in developing countries despite the well-recognized importance of proper child nutrition to health well-being and human capital development (Müller & Krawinkel, 2005; Semahegn et al., 2014). This leads to child mortality which has been seen to remain high in low and middle-income countries. It has been reported that 17% of Nigerian children were exclusively breastfed for less than 4 months, while 13% were exclusively

breastfed for less than 6 months. All these figures are still far below average levels (Oly-Alawuba&Nwuzi, 2018). Researchers have pointed out that good knowledge should be associated with a good attitude and proper nutritional practices (Azizi et al., 2011; Mowe et al., 2008). Nevertheless, good knowledge and attitude do not necessarily translate into good practices in some situations (Bukusuba et al., 2010). More so, inadequate knowledge of appropriate foods and feeding practices is often a greater determinant of malnutrition than a lack of food (Akeredolu et al., 2010). Demand for effective child care has increased markedly in proportion to the number of mothers with young children employed outside the home. Therefore, the need to assess the mothers' breastfeeding, complementary feeding practices and the nutritional status of children in Kaduna South has become important since malnutrition can result from sub-optimal breastfeeding practices, poor quality complementary foods, detrimental feeding practices and contamination of feeding utensils and the effect of such practices on the growing child and mother.

Objectives of the study: The general objective of the study is to access the nutritional knowledge, attitude, and childcare practices of mothers in Kaduna South, Kaduna State. Specifically, the study sought to:

- i. ascertain the nutritional knowledge of mothers in Kaduna South.
- ii. identify the attitude of mothers in Kaduna South towards child nutrition.

- iii. ascertain the child care practices adopted by mothers in Kaduna south

Hypotheses

Two null hypotheses guided the study

Ho1: There is no significant relationship among socio-demographic characteristics, nutrition knowledge, and attitudes of the mothers.

Ho2: There is no significant relationship between nutrition knowledge and the attitude of the mothers.

Methodology

Design of the study: The study adopted a cross-sectional survey research design. A cross-sectional study analyses data from a population, or a representative subset, at a specific point in time (Schmidt & Kohlmann, 2008).

Population for the study: The population for the study was all women of childbearing age that visited the 41 primary health centres in Kaduna South. These health centres usually provide basic health services such as antenatal and postnatal care as well as immunizations, nutrition and family planning education for mothers and children.

Sample and sampling technique: The study adopted a multi-stage sampling technique. Stage one involved the selection of four (30%) out of 13 towns in the study area. The second stage involved a systematic sampling of 15% (6) of the 41 primary health centres. Every registered mother in the health centre present during the time of the study was selected. This gave a total of 130 mothers who formed the sample for the study.

Instrument for data collection: Data were collected with a pretested, semi-

structured, questionnaire. The questionnaire comprised five sections. Section one addressed the socio-demographic characteristics, section two; the nutritional knowledge of mothers, section three; the nutrition attitude of mothers and section five the child care practices adopted by the mothers. The items of the questionnaire were adapted from the Food and Agriculture Organization questionnaires for assessing knowledge, attitudes and practices concerning nutrition and feeding of infants and young children. Duration of continued breastfeeding, age of start of complementary feeding, and ways of making complementary foods more nutritious among others were some of the components of nutrition knowledge that were assessed. The nutrition knowledge scale had 12 items scored on a 5-point Likert scale which ranged from strongly agree to strongly disagree. The attitude scale had 5 items scored on a 5-point Likert scale which ranged from strongly agree to strongly disagree. Components of the attitude towards infant and young child feeding recommendations that were assessed were: complimentary feeding pattern, giving a variety of meals, and feeding frequency amongst others. Total scores were generated for each participant and categorized. The childcare practice sub-scale comprised 21 items with multiple-choice answers. Five areas were addressed which include: feeding practices, personal hygiene, toilet training practices, play practices and sleeping practices. A sample item is; *Do you change an infant's diaper when soiled and do you provide enough toys and play materials for the children?*

Method of data collection: Data were collected using a questionnaire. Three research assistants were recruited and briefed on the modalities of administering the questionnaire. A hundred and thirty copies of the questionnaire were distributed to the mothers who visited the centres on the day of the study to fill and return immediately. Mothers who could not read or write were interviewed by the research assistants and their responses were recorded. The filling of questionnaire took 5-10 minutes to complete. All the distributed questionnaires were retrieved and thus a 100% return rate was recorded.

Informed consent and ethical approval: A prior visit was made to the chief medical directors of the selected primary health centres in the selected towns to get approval for the study. Permission was obtained and a day was given for the visit. Mothers who visited the centres on the day of the study and gave their consent were admitted into the study. An informed consent form was given to them to fill out after explaining the objectives of the study, the procedures involved, assurance of confidentiality and that participation is voluntary. Those who could not fill out the forms gave their oral consent.

Data and statistical analysis: Data obtained were coded and analyzed with statistical products for the social sciences (SPSS) version 21. Data were analyzed using descriptive statistics (frequencies and percentages) and inferential statistics (Pearson's correlation and Chi-square) at a significance level of $p < 0.05$. A knowledge score less than 41 was considered poor, 41-60; good, 61-79;

very good and 81-100; excellent. An attitude score of 1-40 was considered poor, 41-60; good and 80-100; excellent. The childcare practices were analyzed using frequencies and percentages.

Results

Socio-demographic data of the respondents

The majority (60%) of the respondents were between 20 -34 years. Half (50%) of them were students and only 3.1% were Artisans. About 43.8% are single, while the least (1.5%) are widows. The highest educational level of the respondents was BSC/Higher degree

(33.1%). About 32.3% earned less than ₦20,000, while 27.7% earned above ₦50,000.

Nutrition knowledge of the respondents

Figure 1 shows the nutrition knowledge of the respondents. From the figure, the majority (71.8%) of the respondents had excellent nutrition knowledge, 19.1% had very good knowledge while a few (8.4%) had good nutrition knowledge. No respondent showed poor nutrition knowledge.

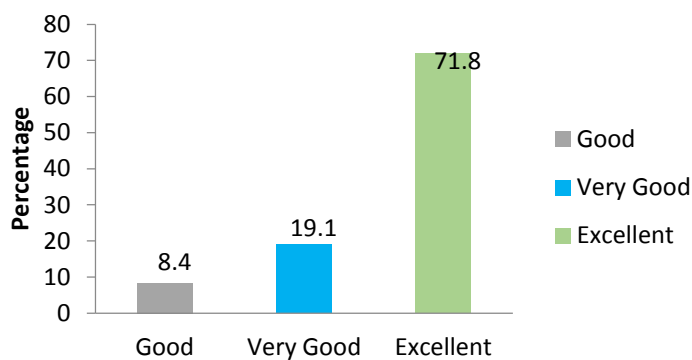


Figure 1: Nutrition knowledge of the respondents

Nutrition attitude of the respondents

Figure 2 shows the nutrition attitude level of the respondents. The result showed that more than half (62%) of the respondents had an excellent nutrition attitude and only a few (8%) had a poor nutrition attitude

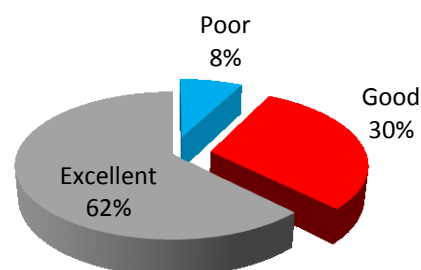


Fig 2: Attitude level of the respondents

Table 1 shows the childcare practices of the mothers. Underfeeding practices, the majority (70.8%) of the mothers give their children breast milk immediately after delivery. More than half (55.8%) breastfeed their child on demand and 90.6% use infant formula in place of breast milk. In the area of personal hygiene, hand washing before feeding was the predominant (96.2%) practice among the respondents. The majority (91%) change their children's diaper once it is soiled and (96.9%) of the

respondents engage more in teaching their children words for urinating and defecating as toilet training practices. Most of them (94.6%) create time for children's indoor and outdoor play activities and 86.9% provide enough toys and play materials for the children. Among sleeping practices, providing for a child what he/she needs to sleep (96.2%) and ensuring sleep/rest environments and equipment are safe and free from hazards (96.2%) were the two most reported practices.

Table 1: Childcare practices of the respondents

Practice Items	F	%
Feeding Practices		
What did you give the child immediately after delivery?		
Breast milk	92	70.8
Warm water	23	17.7
Glucose water	10	7.7
Infant formula	3	2.3
Nothing	3	1.5
How many times in a day do you breastfeed your child		
< 4 times	4	3.1
4-7times	27	20.8
8-10 times	11	8.5
On demands	72	55.4
Don't know	16	12.3
What kind of food are you giving in place of breast milk?		
Infant formula	116	90.6
Solid food	10	7.8
Others	4	3.9
Personal Hygiene		
Do you wash the baby's hands with soap before feeding?		
Yes	72	55.4
No	55	40.8
Don't know	3	2.3
Toilet Training Practices		
Do you change an infant's diaper when soiled?		
Yes	118	91
No	5	4
Don't know	7	5

Do you teach children words for urinating and defecating?		
Yes	126	96.9
No	4	2.1
Play Practices		
Do you specially create time for children's indoor and outdoor play activities?		
Yes	123	94.6
No	3	2.3
Don't know	4	2.1
Do you provide enough toys and play materials for the children?		
Yes	113	86.9
No	16	12.3
Don't know	1	0.8
Sleeping Practice		
Do you provide for a child what he/she needs to sleep such as singing, rocking, or a special toy?		
Yes	125	96.2
No	4	3.1
Don't know	1	0.8
Do you ensure sleep and rest environments and equipment are safe and free from hazards?		
Yes	125	96.2
No	1	0.8
Don't know	4	3.1

F= frequency, %= percentage

Hypothesis 1: There are no significant relationships among socio-demographic characteristics, nutrition knowledge and attitude of the mothers.

Table 2 shows the relationship among nutrition knowledge, attitude and socio-demographic status of the respondents. From the table, a significant relationship was seen to exist between the nutrition knowledge of the respondents and their occupations. Most (90.9%) of the respondents who

had excellent nutrition knowledge were unemployed. Only occupation had a significant relationship with the attitude of the respondents ($\chi^2 = 20.53$, $p = 0.03^*$) among other socio-demographic characteristics of the respondents $p < 0.05$. The null hypothesis was then rejected for another socio-demographic status except for occupation which is related to nutrition knowledge and attitude.

Table 2: Relationship among nutrition knowledge, attitude, and socio-demographic status of the respondents

	Nutrition Knowledge			Attitude		
	Good F (%)	V.Good F (%)	Excellent F (%)	Poor F (%)	Good F (%)	Excellent F (%)
Age						
15-19years	3(10.7)	4(14.3)	21(75.0)	4(14.3)	8(28.6)	16(57.1)
20-34years	8(9.2)	19(21.8)	60(69.0)	6(6.9)	24(27.6)	57(65.5)
35 years above	0(0.0)	2(13.3)	13(86.7)	0(0.0)	7(46.7)	8(53.3)
$\chi^2 = 3.02, p = 0.56$				$\chi^2 = 4.82, p = 0.30$		
Occupation						
Student	6(9.2)	18(27.7)	41(63.1)	6(9.2)	20(30.8)	39(60.0)
Civil servant	1(4.3)	4(17.4)	18(16.6)	0(0.0)	11(47.8)	12(52.2)
Trader	2(8.7)	1(4.3)	20(87.0)	4(17.4)	0(0.0)	19(82.6)
Unemployed	0(0.0)	1(9.1)	10(90.9)	0(0.0)	6(54.5)	5(45.5)
Farmer	0(0.0)	1(25.0)	3(75)	0(0.0)	1(25.0)	3(75.0)
Artisans	2(50.0)	0(0.0)	2(2.9)	0(0.0)	1(25.0)	3(75.0)
$\chi^2 = 18.84, p = 0.04^*$				$\chi^2 = 20.53, p = 0.03^*$		
Marital Status						
Single	6(10.5)	15(26.3)	36(63.2)	7(12.3)	14(24.6)	36(63.2)
Married	4(6.3)	9(14.3)	50(79.4)	2(3.2)	22(34.9)	39(61.9)
Divorced/separated	1(12.5)	1(12.5)	6(75.0)	0(0.0)	3(37.5)	5(62.5)
Widow	0(0.0)	0(0.0)	2(100.0)	1(50.0)	0(0.0)	1(50.0)
$\chi^2 = 5.12, p = 0.53$				$\chi^2 = 10.38, p = 0.11$		
Highest Educational Qualification						
SSCE	1(2.8)	10(27.8)	25(69.4)	3(8.3)	9(25.0)	24(66.7)
OND/NCE	3(21.4)	1(7.1)	10(71.4)	4(28.6)	4(28.6)	6(42.9)
HND	5(13.9)	6(16.7)	25(69.4)	1(2.8)	12(33.3)	23(63.9)
B.Sc	2(4.7)	8(18.6)	33(76.7)	2(4.7)	14(32.6)	27(62.8)
M.Sc/Ph.D	0(0.0)	0(0.0)	1(100.0)	0(0.0)	0(0.0)	1(100.0)
$\chi^2 = 9.30, P = 0.32$				$\chi^2 = 11.72, p = 0.16$		
Number of Children						
Less than 3	4(6.2)	14(21.5)	47(72.3)	7(10.8)	22(33.8)	36(55.4)
3 to 5	6(10.7)	11(19.6)	39(69.6)	3(5.4)	13(23.2)	40(71.4)
6 and above	1(11.1)	0(0.0)	8(88.9)	0(0.0)	4(44.4)	5(55.6)
$\chi^2 = 3.13, P = 0.53$				$\chi^2 = 5.09, P = 0.29$		

V. Good= very good, F= frequency, %= percentage, df = degree of freedom, p = level of significance, χ^2 = chi-square value

Hypothesis 2: There is no significant relationship between nutrition knowledge and the attitude of the mothers.

Table 3 shows the relationship between nutrition knowledge and the attitude of the respondents. From the table, a significant positive relationship was

seen between nutrition knowledge and the attitude of the respondents ($r = 0.30^{**}$, $P = 0.00$). This implies that the more knowledge the respondents acquire on infant and young child nutrition, the better their attitudes towards that. The null hypothesis was therefore rejected.

Table 3: Relationship among nutrition knowledge, attitude and infant and young child feeding practices of the respondents

		Attitude	Nutrition Knowledge
Attitude	Pearson Correlation	1	0.30**
	Sig. (2-tailed)		0.00
Nutrition Knowledge	Pearson Correlation	0.30**	1
	Sig. (2-tailed)	0.00	

** = significant at 0.05

Discussion

A greater percentage of the respondents were between 20 -34 years. This is in line with the study by Egenti et al. (2018) and Somefun and Ibisomi (2016) in northern Nigeria, whose respondents were between 25-34 years. Half of the respondents were students. This could be attributed to the location of the research, as Kaduna State is in the northern part of Nigeria and the northern part of Nigeria is known for early marriage. The highest educational level of the respondents was BSC/Higher degree. This reveals the impact of the girl child education advocacy programme in the study area. However, the finding contradicts that of Somefun and Ibisomi (2016) that revealed no formal education among the majority of the respondents.

The majority of the respondents had excellent nutrition knowledge and nutrition attitude. This could be linked to the fact that governmental and non-governmental agencies over the years have organized nutrition education programmes, especially in rural areas in response to the high burden of nutrition ex-rayed by suboptimal infant and young child feeding (IYCF) practices in developing countries like Nigeria (WHO, 2009; Caetano et al., 2010; Tagbo & Ughasoro, 2009; Safari et al., 2013; Muhimbula, & Issa-Zacharia, 2010). The result of this study is in line with findings from other studies (Mundia,

2012; Bimpong et al., 2020) which revealed that the majority/about half of the mothers had good nutritional knowledge compared to the few that had a low knowledge level. The finding of this study, however, contradicts that of Afolabi et al. (2017) which revealed that most of the mothers had low nutritional knowledge. Another study by Nassanga et al. (2018), revealed that whereas a high proportion of caregivers had good knowledge and attitude regarding complementary feeding, most of them had poor nutritional practices. The good nutrition attitude observed among mothers in this study is in line with that of Bimpong et al. (2020) who found that the attitude of mothers towards infant and young child feeding practices was positive.

The majority of the respondents showed good childcare practices as they reported giving their children breast milk immediately after delivery, and breastfeeding their children on demand. They also reported washing their hands before feeding their children, changing their children's diaper once it is soiled and teaching their children words for urinating and defecating as toilet training practices. Furthermore, they create time for children's indoor and outdoor play activities, provide enough toys and play materials for the children, provide for the child what he/she needs to sleep and ensure sleep/rest environments and equipment are safe

and free from hazards. These good practices could be attributed to their occupation as the majority of them are students who have acquired one form of training or the other and have better resources than the less educated to provide better health services and practices for their children.

A significant relationship was seen to exist between the nutrition knowledge of the respondents and their occupations. This is contrary to the null hypothesis stated in the study. Those who were unemployed had high nutrition knowledge. This result is, however, not out of place as employed mothers may not have much time to attend nutrition education programmes due to their tight work schedule. This finding is in line with several studies which have shown that the working status and nutritional knowledge level of the mother are positively related to the feeding practices of the mothers (Ozdogan et al., 2012; Ucar et al., 2012; Sunwoong et al., 2000). They opined that mothers who are knowledgeable about good nutrition select the right food for themselves and their children. Similarly, in the study conducted with 324 women living in Swaziland, it was found that employment status was significantly associated with nutritional practices (Masuki & Lan, 2014). The finding of the study is therefore not out of place as one's occupation determines to an extent their income. However, the finding of this study did not corroborate the finding of the study by Özdoğan (2012) which showed that the nutritional knowledge of mothers in the study area increased with a corresponding increase in their education level.

A significant positive relationship was seen between nutrition knowledge and the attitude of the respondents. This shows that as the mothers gain more nutrition knowledge, their attitude towards infant and young child feeding becomes more positive. This reaffirms the findings of several studies which revealed that good knowledge should be associated with a good attitude and proper nutritional practices (Azizi et al., 2011; Mowe et al., 2008). Similarly, O'Brien and Davies (2007) highlighted that a high degree of nutritional knowledge is known to influence nutritional intake or practices.

Conclusion

Mothers in the study area had excellent nutrition knowledge, feeding practice and attitude. Hand washing before feeding, more engagement in teaching children words for urinating and defecating, creating time for children's indoor and outdoor play activities, providing for a child what he/she needs to sleep and ensuring sleep/rest environments and equipment are safe and free from hazards were the two most reported childcare practices. The nutrition knowledge of the mothers was seen to be positively related to their occupation. Unemployed mothers had better nutrition knowledge than working mothers. More so, the nutrition knowledge of mothers was related to better nutrition attitudes, and feeding practices adopted by them.

Recommendations

Based on the findings, it was recommended that more infant and young child nutrition information should be made available to the mothers as this will enhance their

attitude and practice. Primary health centre workers should develop a framework that will ensure that mothers apply the knowledge gained.

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Influence of Covid-19 Safety Protocols on Production and Sales of Sachet Water in Nsukka Local Government Area, Enugu State, Nigeria

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Abstract

This study examined the influence of covid-19 protocols on the sales of sachet water in the Nsukka Local Government Area of Enugu state. Three research questions guided the study. However, only 140 sellers of sachet water who were willing to participate in the study constituted the sample. The instrument for data collection was a structured questionnaire titled: Influence of covid19 protocols on the sales of sachet water questionnaire (ICPMDSBWQ) which was validated by three lecturers from the Department of Business Education, University of Nigeria, Nsukka. The collected data were analysed using frequency and percentage scores. The general findings of the study indicated that sachet water sellers lost customers because of not enforcing the wearing of masks in their outlets during the pandemic. Social distancing reduced the number of customers while the lockdown led to a decrease in the sales of sachet water. Based on the findings, the study recommended among others, that manufacturers of consumables such as sachet water enforce health and safety protocols to ensure sustainable business progress even during a global crisis such as Covid -19.

Keywords: Covid-19 Protocols, Sachet water, Manufacturing industries, Sales

Introduction

The world health organisation declared covid-19 a pandemic on March 11, 2020 (WHO, 2020). Coronavirus Disease (covid19) acronym was created by the World Health Organisation (WHO). It stands for the respiratory illness caused by the coronavirus SARS-CoV-2. The incubation time for COVID-19 ranges from 1-14 days, most commonly being around 5 days (WHO, 2020). Several wholesale and retail businesses in manufacturing industries were impacted by covid19 lockdown that

lasted from 26 March to 4 May 2020 (NCDC, 2020), as well as a range of continuity of restrictions on market activities and travel after the lockdown was lifted. From 4 May, markets and manufacturing industries like sachet water manufacturing industries were permitted to open three days per week from 9 am to 3 pm (Hakeem et al 2021). Wearing of nose mask was compulsory in the market and also in the manufacturing industries. Hand-washing facilities were available in the market and manufacturing industries to

curb the spread of the virus to an extent. The COVID-19 crisis and the consequent lockdown affected every aspect of modern living.

The economy was largely brought to a standstill, and almost every country was on the brink of a recession (Hoekstra & Leeftang, 2020). Some of the measures used to contain the virus such as social distancing, lockdown and wearing of nose masks affected the distribution of various consumable goods such as drinking water. Access to the water of sufficient quantity and acceptable quality was one of the major problems faced by many households in urban areas such as Nsukka. This led to increased demand for water packaged in disposable plastic bottles and small sachets, as well as in large refillable containers (Sridhar et al., 2017).

Sachet or potable water is water packaged in plastic materials for human consumption. It is meant to be packaged under hygienic and sanitary conditions to achieve acceptable quality in terms of its physical, chemical, microbiological and acceptability parameters so that it can be safely consumed as drinking. Efforts should therefore be made to maintain sachet water quality at the highest possible level. Sachet water comes from a variety of sources including municipal tap water, natural springs and wells (Shallcross, 2022). The sale of sachet water has increased in recent years due to the perception that it is safe, hygienic, and/or handy and also because of its aesthetic appeal (Doria et al., 2009). Sachet water is easier to use when people are in crises like in covid19 pandemic compared to families sharing the same cups for drinking water.

Sachet water manufacturers distribute their products through

marketing intermediaries such as wholesalers and retailers or they may sell directly to the consumers. The manufacturers have to ensure that the products are readily available to the distribution outlets. The whole sellers and retailers function as the middlemen who buy sachet water in bulk from the producers and sell it to the consumers. These intermediaries are very necessary because production cannot be completed until the goods get to the final consumers. Sachet water business has been a very profitable business in Nsukka before covid19 pandemic. However, as a result of the pandemic, sachet water sellers might have experienced changed buying behaviours. The shutdowns and reductions in work activities were likely to have affected sales, customers' patronage, and substantial lost income for business owners and might even result in a decrease in employment and permanent closure of some companies (Block et al., 2021; Senol et al., 2021).

Purpose of the study: The purpose of this study was to examine the influence of covid-19 safety protocols on sales of sachet water in Nsukka LGA, Enugu state, Nigeria. Specifically, the study determined the;

- i. influence of covid-19 nose mask wearing on the sales of sachet water in Nsukka LGA, Enugu State, Nigeria;
- ii. influence of covid-19 social distancing on the sales of sachet water in the study area, and
- iii. influence of covid-19 lockdown on the sales of sachet water in the area.

Methodology

Study design: The study adopted a descriptive survey research design to find out the influence of covid19 protocols on the sales of sachet water in Nsukka LGA Enugu State, Nigeria. According to Nworgu (2015) descriptive survey is a type of research design in which a group of people or items are studied by collecting and analysing data from only a few people or items considered representative of the entire population.

Population for the study: The population of the study consisted of about 200 sachet water manufacturers/sellers in Nsukka Local Government Area.

Sample selection technique: The sample for the study comprised 140 sachet water manufacturers/ sellers drawn through the convenience sampling technique. According to (Lavrakas, 2008) convenience sampling is a type of non-probability sampling in which people are sampled simply because they are a "convenient" source of data for researchers. In probability sampling, each element in the population has a known non-zero chance of being selected through the use of a random selection procedure. The technique was used because only willing sachet water sellers constituted the sample population size.

Instrument for data collection: The instrument used for data collection was a structured questionnaire made up of three parts. The first part obtained information on the influence of covid-19 nose mask-wearing on the sales of sachet water. The second part focuses on the influence of covid-19 social distancing on the sales of sachet water.

The third part obtained information on the influence of covid-19 lockdown on the sales of sachet water. Items in 1, 2 and 3 were placed on Yes or No scale to determine the percentage of the responses.

Validation and reliability test of instruments: The instrument was validated by three experts from the Department of Business Education, University of Nigeria Nsukka. The instrument was administered to 140 sellers of sachet water. The instrument was subjected to Cronbach Alpha reliability analysis. The result showed a reliability coefficient of 0.82, indicating that the instrument was reliable.

Statistical analysis: The data collected from the respondents were analyzed using frequency and percentage. Percentages $\geq 50\%$ were accepted as a factor. The computation was done with the application of statistical products for service solutions (IBM SPSS version 20).

Results

Effects of covid-19 nose mask wearing on the sale of sachet water

The result presented in Table 1 showed the effects of covid-19 nose mask-wearing on the sale of sachet water. The result showed that 86.4% of sachet water sellers reported a loss of customers because of not enforcing mask orders in their shops, and 62.1% reported that an increase in the price of nose masks decreased sachet water sales. Also, regular purchases of nose masks increased the overall cost of production (61.4%). Some (55.7%) of sachet water sellers gained some customers because of enforcing mask rules in the shop.

Table 1: Frequency and percentages of the respondents on the effects of Covid-19 nose mask wearing on the sales of sachet water.

Effects of covid-19 nose mask wearing on the Sales of sachet water	Frequency Yes	%	Frequency No	%
An increase in the price of nose masks decreased sachet water sales.	87	62.1	53	37.9
Regular purchases of nose masks increased the overall cost of production.	86	61.4	54	38.6
Lost customers because of not enforcing mask orders in the shop.	121	86.4	19	13.6
Gained some customers because of enforcing mask rules in the shop.	78	55.7	62	44.3

Effects of social distancing on the sales of sachet water

The result presented in table 2 showed the effects of social distancing on the sales of sachet water. The result showed that compliance with social distancing reduced the number of customers sachet water sellers could attend to in a day (87.1%). Many (61.4%)

reported that social distancing decreased the distribution of sachet water to families. Social distancing also affected store communication among 80.0% of the respondents and delayed the production of sachet water (52.9%).

Table 2: Frequency and percentages of the respondents on effects of social distancing on the sales of sachet water.

Effects of social distancing on sales of sachet water	Frequency Yes	%	Frequency No	%
Social distancing reduced the number of customers.	122	87.1	18	12.9
Observing social distancing in public transport increased transportation fees.	44	31.4	96	68.6
Social distancing decreased the distribution of sachet water to families	86	61.4	54	38.6
It affected store communication.	112	80.0	28	20.0
Social distancing delayed the production of sachet water.	74	52.9	66	47.1

Effects of covid19 lockdown on the sales of sachet water

The result presented in table 3 showed the effects of the lockdown on the sales of sachet water. The result showed that 87.1% of the respondents reported that

the lockdown led to a decrease in sales. Lockdown also limited sales time (80.7%), led to appointment shopping (55.7%) and reduced the number of customers (53.6 %).

Table 3: Frequency and percentages of the respondents on the effects of covid19 lockdown on the sales of sachet water.

Effects of covid19 lockdown on the sales of sachet water.	Frequency Yes	%	Frequency No	%
It led to a decrease in sales	123	87.9	17	12.1
It reduced the number of customers.	75	53.6	65	46.4
Led to appointment shopping	78	55.7	62	44.3
Limited sales times	113	80.7	27	19.3
Hindered access to some customers.	43	30.7	97	69.3

Discussion of Findings

The findings of the study revealed that the Covid19 safety protocol of wearing a nose mask affected the sale and distribution of sachet water. Regular purchase of nose masks increased the overall cost of sachet water distribution during the pandemic and the increase in the price of nose masks decreased sachet water sales. This is probably because most businesses preferred to use disposable nose masks which were believed to be more hygienic than washable ones. They, therefore, had to buy them frequently which generally added to the expenditure of the business. The further finding showed that many of the sellers lost customers because of not enforcing mask orders during the pandemic. However, some reported gaining more customers because they enforced mask rules in the shop. When at a store, customers felt more comfortable if other buyers were wearing a mask. Wearing a mask makes customers feel less likely to contact the virus, therefore, businesses that did not enforce mask-wearing rules during the pandemic were more likely to lose their customers. A similar finding by Senol et al. (2021) showed that small businesses experienced a decrease in business sales as a result of complying with the safety protocols.

The findings of the study also revealed that social distancing reduced the number of customers, decreased the distribution of sachet water to families, affected store communication and delayed the production of sachet water. This might be because, fewer workers were able to be at the workplace at a time, hence increasing the workload of the workers, thereby delaying production. Compliance with social distancing also reduced the number of customers a sachet water seller could attend to in a day, especially in industries that do not have enough space. Social distancing affected the way sellers of sachet water related with their customers. This was expected because many businesses limited the number of customers that could be attended to per time. This led to diminished customer presence at business premises and hence cordial interaction with sellers.

The findings revealed that covid19 lockdown led to a decrease in sales of sachet water, limited sales time of sachet water, led to appointment shopping, and also reduced the number of customers. Lockdown reduced the marketing of sachet water significantly by reducing the number of days and hours, sachet water sellers could make their products available to customers.

These findings support earlier findings of Aragbonfoh (2021) who observed that as a consequence of the lockdown, many businesses were shut down and had diminished sources of revenue. Nicola et al. (2020) also noted that as a consequence of covid19 lockdown, businesses especially SMEs which include the sachet water business suffered from the diminished demands.

Conclusion

The findings of this study highlighted the impact of the Covid-19 safety protocols on the production and distribution of sachet water. Wearing nose masks, social distancing and locking down all affected the sachet water business in various ways. While the enforcement of nose mask-wearing improved business patronage, it also led to an increase in the overall cost of production. Social distancing affected the number of customers that could be attended to at a time and also affected the interaction between workers and customers. On the other hand, the lockdown affected the movement of people and goods, hence limiting the distribution of water to consumers. The outbreak of covid-19 and the resultant lockdown took a heavy toll on the sachet water manufacturing industries in Nsukka.

Recommendations

1. Masks should be used as part of the business strategy to increase sales. The focus of sachet water manufacturers should be on limiting the direct impact covid-19 on employees and customers whilst supporting efforts to limit the spread of the virus.

2. The content and channels used to reach new and existing customers must be given extra thought. While social distancing has become the new normal for businesses embracing digital strategies and technology has and will continue to help increase sales.

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Preference and Selection of Used Clothing among Civil Servants in Benue State

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Abstract

The study assessed the selection of used clothing for the survival of civil servants in the changing society of Benue State. The study had three objectives: To identify ways of clothing selection, types of fabric supplied and types of clothing preferred. The Population consisted of 4000 Benue State civil servants. The sample size was 200. The data collection instrument was a self-reported structured questionnaire validated by experts and with a Cronbach alpha of 0.72. The data were analyzed using descriptive statistics. The findings identified 11 ways of selecting used clothing. These include visiting the used cloth market (M= 3.04). The finding further revealed that twelve types of fabric were supplied through bail which includes cotton (M = 3.56) and acetate (M= 2.5). The findings also revealed six types of preferred used clothes which are gowns (M= 3.40), skirts/trousers (M= 3.00), shirts with a skirt (M= 3.02) and blouses with a skirt (M= 2.84). The study concluded that civil servants in Benue state preferred to use clothing such as gowns, skirts, blouses, trousers and shirts as work clothing because they are more affordable and accessible. The study recommended that bale of fabric supplied by traders should contain the six types preferred by the civil servants.

Keywords: Selection; Preference; Used clothing; Civil servants, Benue State.

Introduction

Civil service is more of sedentary office work, which does not require much vigorous physical activity. Civil service is one of the major occupations of the residents of Benue state in addition to trading and farming. These groups of workers include teachers and staff of various ministries and parastatal. In the time past, the civil service commission paid workers many allowances

including a dressing allowance. These allowances enabled workers to afford various needs such as brand-new clothing. With the current economic changes in the country, many workers do not receive such allowances anymore and even salaries have become grossly inadequate and irregular. As a result, many government employees are not able to afford some commodities including brand-new

clothes. Therefore, in order to meet their need for work clothing, civil servants resort to the selection and purchasing of used clothing.

Clothing selection according to Ida et al. (2021) involves deciding on what to wear, how to purchase or obtain what to wear and when to wear clothes for various occasions. In their view, clothing selection does not end until the clothing article is worn on the body. Clothing selection practices of any given person include all the procedures involved in planning, shopping and wearing clothing. Individuals could decide to select brand-new clothing which is usually packaged, or they could go for used clothing.

Used clothing includes wears previously used by other people, which usually comes in bale, for sale or reuse (Alex, 2022). Most of the used clothing sold in Nigeria is imported from Europe and America where they have been fairly worn without much wear and tear. A good number of them still retain their colour, shape, texture and viability, and therefore have value for reuse. According to Collins (2022) used clothing is affordable and can save money. Their styles are also usually more authentic and unique compared to new clothing. They are therefore suitable for work clothes. Madison (2022) highlighted the benefits of selecting used clothing as it reduces environmental impact, promotes exploitative work conditions, saves money and has a unique vintage style which looks more authentic. According to Jade (2020) used clothing helps to reduce fast fashion demand, is easier to shop, lasts longer, saves resources and is unique.

Despite these advantages, poor selection of used clothing articles could also lead to poor dressing and the shabby appearance of individuals. Civil servants interact with people from various walks of life in the course of their daily duties, therefore, they need to appear smart and confident in their work clothes without being unnecessarily expensive. These values are usually obtainable with used clothing. However, when workers make a poor selection of used garments and accessories, they might end up not getting good dressing value from the purchase. It is therefore imperative to assess the preference and selection of used clothing among civil servants in Benue State to provide empirical information that will enable the sellers and buyers of used clothing to enhance their choices of used clothing.

Objective of the study

The main purpose of this work was to assess the preference and selection of used clothing among civil servants in Benue state.

Specifically, the study;

1. identified ways of selecting used clothing by civil servants in Benue state;
2. determined the textiles fabric that comes in used clothing bales for selection and
3. determined the preferences of different types of used clothing that come in bales for civil servants in Benue State.

Methodology

Study design: Descriptive survey design was adopted for the study.

Population for the study: The population of the study was 4000 Benue

State civil servants (State civil service commission worker's register, 2021).

Sample for the study: The sample size for the study was 180 civil servants. A two-staged sample technique was used to select the sample. The first stage involved a purposive selection of the state capital and one local government area from each of the three geopolitical zones in the State. The second stage involved a random sampling of 50 civil servants from each zone and the state capital bringing the sample size to 200 civil servants. However, 180 completed questionnaires were returned which became the actual sample for the study. These civil servants were teachers and workers in the state parastatal.

Instrument for data collection: The instrument used for data collection was a self-reported structured questionnaire, titled Preferences and the Selection of Used Clothing Questionnaire (PSUCQ). The instrument had four points rating scale of Strongly Agreed 4 Agreed 3, Disagreed 2 and Strongly Disagreed with their nominal values of 4, 3, 2, and 1 respectively. The instrument contained two parts. Part A collected information on the demographic characteristics of the respondents. While part B collected data on ways of selecting used clothing among civil servants, information on the Textile fabrics that come in bale, and information about the preferences of used clothing by the civil servants in Benue State.

Validity and reliability of the instrument: The Instrument was validated by three experts, two from the Home Economics department, in the faculty of Vocational and Technical

Education, University of Nigeria Nsukka, one also from the Department of Vocational and Technical Education Faculty of Education Benue State University Makurdi. The experts assessed the instrument for proper wording, consistency, and representation. Suggestions and corrections made by them were utilized to improve the instrument. The reliability of the instrument was determined with a pilot test using 20 civil servants in Nasarawa State; the data generated from the pilot study were analyzed using SPSS version 23. Cronbach alpha yielded a reliability coefficient of 0.72 indicating that the instrument was reliable for the study.

Informed consent: The respondents gave their consent using a consent form. The purpose of the research was properly explained to them after which they signed the form.

Data and statistical analysis: Mean and standard deviation were determined using SPSS version 23. A means score of 2.50 was used as a point for the decision rule. Any item with a mean score of 2.50 and above was accepted as a factor. However, any item with a mean score of less than 2.50 was rejected.

Results

The result in Table 1 below showed the mean responses of the respondents on the ways civil servants select used clothing in Benue State. All the results were above the cut-off mark of 2.50; this indicates that the civil servants in Benue State agreed with all the items stated as how they can select used clothing as shown below.

Table 1: Mean and standard deviation of responses on ways of selecting used clothingN = 180

Ways of Selecting used clothing	Mean	Std Dev	Remark
Check on the internet for an online post for used clothing	2.58	0.29	Agree
Find the prices of the posted used clothing	2.52	0.28	Agree
Negotiating with the sellers on the price	2.50	0.28	Agree
Check the worth of the price compared with the worth of the used clothing	3.00	0.33	Agree
Look for speciality clothes such used for office wear	3.02	0.34	Agree
Visit the used clothing market to sample them for purchase	3.04	0.34	Agree
Put a request for the dealers to bring them for you to make your choice at your comfort place	2.50	0.28	Agree
Look at the fabric name, brand and shape then make your decision	2.56	0.28	Agree

The result in Table 2 revealed the mean responses of the respondents on the type of fabrics that are available in the bale. The fabrics include cotton (3.56), polyester (3.06), linen (3.04), jeans (3.04), a combination of cotton and polyesters (3.02), wool (3.00) and spencer (3.00).

Table 2: Mean and standard deviation of the responses on the textiles fabrics available in bale for purchase N- 180

Textiles fabric that comes in bale	Mean	Standard deviation	Remark
Cotton	3.56	0.27	Agree
Linen	3.04	0.23	Agree
Nylon	2.82	0.21	Agree
Wool	3.00	0.23	Agree
Polyesters	3.06	0.24	Agree
Acetate	2.54	0.19	Agree
Jute	1.40	0.11	Agree
Silk	3.00	0.23	Agree
Combination of cotton and polyesters	3.02	0.23	Agree
Spencer	3.00	0.23	Agree
Jeans	3.04	0.23	Agree
Nino fabric	2.82	0.21	Agree

The result in Table 3 below shows the responses of the respondents on the preference for different types of used clothing. From the table, the preferred types were gowns (3.40), shirts with trousers (3.02), trousers with a t-shirt (3.00), and blouses with a skirt (2.84). The wrapper was not accepted as a preferred cloth (2.03).

Table 3: Mean and standard deviation of the responses on the preferences of the different types of used clothing N=180

Different types of used clothing	Mean	Standard deviation	Remarks
Gowns	3.40	0.48	Agreed
Skirt with shirt	3.00	0.42	Agreed
Blouse with skirt	2.84	0.40	Agreed
Shirt with Trouser	3.02	0.43	Agreed
Trouser and T-shirt	3.00	0.42	Agreed
Wrapper	2.03	0.29	Disagreed

Discussion of findings

The study identified eleven ways in which civil servants in Benue state select used clothing. They include checking on the internet for the online post for used clothing, finding out the prices of the posted used clothing, and negotiating with the sellers on the price. The respondents also compared prices with the worth of the used clothing before they purchased it. They made their choices based on the fabric name, brand, information label and shape of the clothing. They looked for speciality clothes suitable for office wear. Many of them purchased their clothing by visiting the used clothing market to sample them for buying, or by requesting the dealers to bring them to their homes or workplace. These findings agreed with the findings of Herjanto et al. (2019) on the increasing phenomenon of second-hand clothes purchase. The authors stated the ways consumers select used clothing includes online advertisement, buying online and visiting the markets. In line with the suggestion by the label on the clothing articles to get the information of the clothes.

The finding also showed ten textile fabrics that come in bale for selection by civil servants. The commonest fabrics were cotton, polyester and polyesters,

acetate, and silk, a combination of cotton and polyester and spencer. This is in line with Davis V. F (2021) and Venkatraman (2015) who outline fabrics for clothing to include; cotton, wool, chiffon, lace, polyester, and silk linen. Others include nylon and wool.

The findings also revealed five different styles of used clothing that are preferred by the respondents. These included gowns, a skirt and blouse, a shirt and trousers. In line with Anyakoha (2015), suitable clothing for work includes gowns, skirts and blouses, and trousers and shirts. In his study, wrappers were not preferred as work clothes. This is probably because wrappers are not usually part of the dress code for work. Moreover, wrappers are usually not sold as used bale clothes

Conclusion

Used clothing is popularly patronized among civil servants in Benue state as work clothing. They usually select these clothing both online and by physical contact with the dealers. The commonest fabrics selected were cotton, polyester and polyester mostly as gowns, skirts and blouses, shirts and trousers. These styles are often suitable and convenient for sedentary work such as civil service.

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Beef Consumption Pattern among Rural Households in Igbo-Eze North Local Government Area of Enugu State, Nigeria

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Abstract

The study examined the consumption pattern of beef among rural households in Igbo-Eze North Local Government Area of Enugu State, Nigeria. The specific objectives of the study were to describe the socio-economic characteristics of the respondents, assess the frequency of consumption of beef among rural households in the study area, determine their monthly expenditure on beef and the constraints encountered by the respondents in the consumption of beef in the study area. One hundred and fifty rural households were randomly selected from a population of 259,431 of the four autonomous communities (Umuozzi, Umuitodo, Essodo, and Ezzodo) that make up the Local Government Area by the use of stratified random sampling technique. Data for the study were collected using a questionnaire. The collected data were analyzed using descriptive statistics. The result obtained showed that the mean age of the respondents was 43.9 years. The majority (62.7%) of the respondents were females with a mean household size of seven persons. Most of the respondents consumed boiled beef usually during festivities/ceremonies. The mean monthly expenditure on beef was ₦2,663. Constraints encountered by beef consumers include the low financial status of respondents, the high cost of beef in the market and the inadequate supply of the commodity. It was recommended among others that more abattoirs and cold rooms should be constructed in the Local Government Area. Extension and health workers should be well trained and equipped to rightfully inform the rural dwellers on the health benefits of beef consumption and ensure good production of safe beef for consumption.

Keywords: Beef, Protein, Consumption Pattern, Rural household.

Introduction

Responsible protein consumption is being emphasized globally. This is pertinent as over 900 million people are either hungry or malnourished, out of which 800 million are from developing countries of the world. Abdullahi and Aubert (2004) observed that malnutrition and undernutrition are

still problems of great magnitude in many developing countries. According to Ume and Okoronkwo (2013), the body needs an adequate intake of protein as it helps to reduce widespread undernutrition and malnutrition among the ages.

The Food and Agricultural Organization, [FAO] (2003) reported

that out of 70grams of protein per meal required daily per person, 35grams which is supposed to come from the animal source, only about 7grams of animal protein is consumed representing only 20 per cent of animal protein requirement. Thus, the implication here is that the demand for animal protein in Nigeria and other developing countries of the world is far from being met. In any economy, the development of both the production and consumption sector is important.

The role of proteins in the human diet is very critical. Protein as a diet helps to replace the daily loss of body proteins and provides certain hormones of a protein nature. It also provides amino acids for the growth of the fetus during pregnancy and the production of milk protein during lactation (Swaminatha, 2002). The protein requirement of the body can be sourced from plant and animal sources. Protein sourced from animals according to Dalgado (2003) and Oloyele (2005) is superior to plant-sourced protein in the sense that the proportion of essential amino acids is more balanced for tissues within the body and hence, helps to sustain life especially if consumed by diabetic patients. Ighoro (2002) and Ekwe (2019) assert that among other sources of animal protein such as crayfish, milk, fish, chicken, beef, turkey, mutton, chevon, and bush meat, fish and beef are the highest sources of animal protein commonly consumed by man.

Beef is a culinary name for meat from bovines, especially cattle, heifers, buffalo, or bulls. It is a very important meat consumed in Nigeria contributing to more than 32% of all meat consumed in the country (Udoh and Akintola, 2003). Still stressing the economic and

nutritive value of beef, Udoh et al (2003) and Igwe (2022) assert that beef is second to fish as a basic source of animal protein mostly consumed in Nigeria as it contributes 70.93% of total meat consumed while goat meat (chevon), pig meat (pork) and sheep meat (mutton) contribute 13.58%, 9.22%, and 6.22% respectively. In defence of the above Oritse (2021) and Karigidi (2021) observed that out of beef and fish which are the highest sources of animal protein, that fish remains the cheapest form of protein for the average Nigerian.

Beef cattle play a very important role in Nigerian agriculture, contributing about 12% of the nation's Gross Domestic Product (GDP) (Abdu and Dantatta, 2016). According to Umar et al. (2007), Nigerian cattle production amounts to over 14 million, and millions of Nigerians make their livelihood from beef enterprises as producers, marketers, transporters, processors, feed millers, and veterinarians. The consumption of beef is motivated and enhanced by its nutritive value, palatability and availability.

The supply of beef cattle varies from place to place causing a variation in its distribution and overall demand and consumption (Mbanasor, 2000). The reduction in the demand and consumption of beef is an expression of the price of the cattle, its availability, consumers' preference, cultural factors, religious belief, and consumption patterns. There exist several research works on consumers' consumption patterns and intentions toward beef such as Seo et al, (2014), Sherwani et al, (2018), Arenas et al, (2020), Janssen, (2018) and Zhang et al (2018),

explaining household purchase and consumption purchase intentions. The result provided insight into how consumers allocate their resources to consumable goods, and how the consumers place value on beef based on their preference for beef over other sources of animal protein. However, the majority of these studies focused on developed countries. Akerele et al. (2015) and Udoh and Akintola (2003), that analyzed beef demand in Lagos urban city in Nigeria, found that the beef consumption level in Nigeria over the years is still low based on FAO recommendations. Much is not known about the consumption pattern of beef in rural areas of Nigeria.

It is a fact that the human body needs an adequate intake of protein to reduce widespread undernutrition and malnutrition among ages (Ume & Okoronkwo, 2013). This is because the inadequate intake of these nutrients hinders healthy growth and affects the individual ability for productive activities. It is therefore necessary that the consumption pattern of beef, which is an essential source of protein, be studied. Just as the protein per capita intake in Nigeria has been low, there is an observable incidence of infant mortality, mental weakness, poor growth and development among children of rural households in Enugu State. This is because of low protein intake due to much consumption of starchy foods such as fufu, garri, yam and maize without adequate nutritional supplements and nutrients (Udoh & Akintola, 2003). A study like this will provide valuable insights to individuals, families, policymakers as well as those working in the beef industry of consumers' consumption

behaviour and the factors affecting their consumption of beef so that they can more efficiently develop policy and marketing strategies. The results of changing consumption patterns are important for policymakers because they are concerned with food and nutrition security in a period of significant economic change that is meant to improve the overall well-being of the people.

Consumer preferences and consumption patterns are the main determinants of the demand for meat. It is a fact that fish and beef are the highest sources of animal protein commonly consumed by man. Observation and personal interviews have shown that the consumption and purchase intention of the people in the study area towards beef is low compared to that of fish, even though there are beef marketers just as there are fish marketers in the study area. This agrees with the findings of Akerele et al (2015) that rural households in the Yewa local government area of Ogun state, Nigeria prefer fish to beef as their main source of protein. Not much has been done empirically about the consumption pattern of beef among rural/farming households in the study area as all knowledge about the subject matter has been on mere assumption. There is therefore the need to fill the gap in empirical evidence of beef consumption patterns in the study area among rural households in the study area. This hence, makes the study worth doing considering the following objectives:

- i. Describe the socio-economic characteristics of the respondents;

- ii. assess the frequency of consumption of beef among rural households in the study area;
- iii. Determine the monthly expenditure of beef by the rural households in the study area and
- iv. Identify the constraints to the consumption of beef in the study area.

Methodology

Study design: The study adopted a descriptive survey research design. According to Anyahoha (2009), descriptive survey research design uses questionnaires, interviews and observations to determine the opinions, attitudes, preferences and perceptions of people. The survey research design was considered appropriate as it elicits information from the respondents concerning their consumption pattern of beef.

Area of the study: The study was carried out in Igbo-Eze North Local Government Area of Enugu State, Nigeria. The Local Government Area is comprised of four major autonomous town communities namely: Umuozzi, Umuitoddo, Essodo and Ezzodo, made up of 36 autonomous villages. The Local Government has an area of 293 km² (113 sqm) and a population of 259,431 people as of the 2006 census, the majority of whom are mainly farmers (NPC, 2006). The area lies roughly between latitude 6°59'N and longitude 7°27'E. Kogi and Benue States border the Local Government. Crops grown include roots and tuber crops (yam, cassava, and cocoyam), cereal (maize), and tree crops (oil palm, kola and pear). The study population comprises all rural households in the Local Government Area.

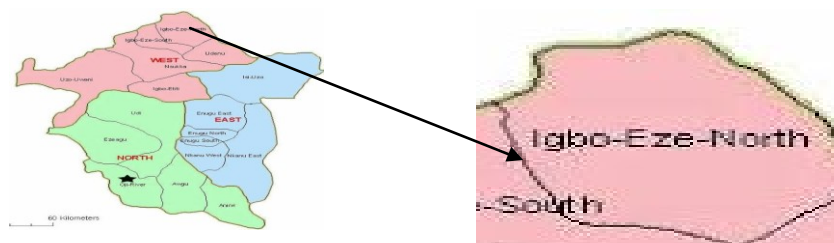


Fig 1: Map of Enugu State showing the study area

Population for the study: The study population comprised all rural households in Igbo- Eze North Local Government Area. The area has a population of 259,431 people as of the 2006 census, the majority of whom are mainly farmers (NPC, 2006).

Sample size selection: A stratified random sample technique was adopted in the conduct of the research. In the first stage, the four major autonomous communities (Umuozzi, Umuitodo,

Essodo and Ezzodo) comprising 36 autonomous villages that make up the local government area were selected. In the second stage, 25 autonomous village communities were randomly selected from the 36 sampled communities. This is to produce a fair representation of the entire local government area. In the third stage, six households were randomly sampled from each of the twenty-five earlier sampled village communities, thus, giving 150

households used for the study. Male and female household heads who identified as beef consumers were purposively selected for the study.

Instrument for data collection: The instrument for data collection was a questionnaire used to solicit primary information from the respondents. This instrument was divided into four sections namely A, B, C and D. Section A consisted of items on the background information of the respondents. Section B comprised items eliciting information on the frequency of consumption of beef among rural households. This was determined by using a 7-point Hedonic measurement scale weighted as follows: Daily (7), 5 – 6 days/week (6), 3 – 4 days/week (5), 1 – 2 days/week (4), once in a week (3), during festivities (2) and not at all (1). Section C determined the monthly expenditure of the respondents on beef in the study area, while section D elicited information on the constraints to beef consumption in the study area. This was done by using a 3-point Likert rating scale of Very High Extent (3), High Extent (2) and Very Low Extent (1).

Validation and reliability of the instrument: Three experts from the Department of Agricultural Education, Federal College of Education, Eha-Amufu, Enugu state, validated the instrument. The Cronbach-Alpha reliability method was used to determine the internal consistency of the items. The reliability coefficient of the instrument was 0.87. Therefore, the instrument was reliable and suitable for the study.

Method of data collection: One hundred and fifty copies of the questionnaire were administered to the respondents by the researchers with the

aid of five research assistants. The assistants were recruited from the communities selected for the study to help in interpreting the questionnaire items in the local dialect. All 150 (100%) copies of the questionnaires were retrieved and used for data analysis.

Data and statistical analysis: Descriptive statistics such as frequency, percentages and means were used to analyze data. The scored responses on the frequency of beef consumption were multiplied by each Hedonic weight and divided by the response pooled together. The status of frequency of consumption was established in a 3-category frame by dividing the maximum response value (7) by the 3 categories to obtain a class mark of 2.33 which produced the categories as follows: 0.00 – 2.33 as scarcely consumed, 2.34 – 4.67 as occasionally consumed and 4.67 – 7.00 as frequently consumed as employed by Madukwe et al. (2000) and Ekwe (2019). Also, to obtain the constraints to beef consumption, the scored responses of the Likert rating scale were multiplied by each Likert weight and divided by the response pooled together. This gave a benchmark of 2.0 used as the cut-off point. This implies that any problem with a mean score of 2.0 and above was a major problem and should be accepted and any score below 2.0 was not considered a major problem and hence rejected.

Results

Socio-Economic Characteristics of the Respondents

Table 1: Presents the distribution of respondents based on their socio-economic characteristics. The table shows that there was more female

patronage (purchase) of beef than males as the sample consists of 37.3 % males and 62.77 % females with a mean age of 43.9 years. Most (83.3%) of the respondents were married, and 78% of the respondents were full-time farmers. The mean household sizes of the respondents were seven persons/house. A greater proportion (48.7% and 30%) of the respondents had primary and secondary education respectively. The mean annually estimated income of the respondents gave a mean yearly income of ₦97,150.

Table 1: Distribution of respondents according to their socio-economic characteristics

Socio-economic Variable	f	%
Age		
20 – 39	73	48.7
40 – 59	50	33.3
60 and above	27	18
Mean	43.9	
Sex		
Male	56	37.3
Female	94	62.7
Household size		
1 – 3	19	12.7
4 – 6	44	29.3
7 and above	87	58
Mean	6.78	
Occupation		
Full-time farmer	78	52
Civil Servant	28	18.7
Artisan	19	12.6

Trading 25 16.7

Education

Primary 51 48.7
 Secondary 45 30
 Tertiary 11 7.3
 No education 21 14

Occupational experience

Less than 10 years 52 34.7
 10 – 39 years 87 58.0
 40 and above 11 7.3

Mean 17.34

Estimated annual income f %

(₦)

Less than 50,000 36 24
 51,000 – 100,000 55 36.7
 Above 100, 000 59 39.3

Mean ₦97, 150

Marital status

Married 125 83
 5 3.3

Single/divorced

Widow 20 13.4

Frequency of consumption of beef among rural households in the study area.

The frequency of the consumption of beef among rural households in the study area is presented in table 2. The result shows that among the consumption form of beef in the study area, beef is consumed mostly in the forms of boiled (x=4.12), fried (x=3.89) and roasted (x=2.70).

Table 2: Distribution of respondents according to the frequency of consumption of beef in the study area

Beef Forms	Frequency of Consumption							Mean Max = 7	Remarks
	Everyday (7)	5-6 days/weeks (6)	3-4 days/weeks (5)	1-2 days/weeks (4)	Once in 2 weeks (3)	During festivities/ceremonies only (2)	Never (1)		
Fried	6	16	24	28	60	17	0	3.89	Occasionally consumed
Roasted	0	18	9	6	32	78	7	2.70	Scarcely consumed
Boiled	18	29	21	16	18	48	0	4.12	Occasionally consumed

Key: 1-2.33 (scarcely consumed); 2.34-4.66 (occasionally consumed) and 4.67-7 (frequently consumed)

Monthly expenditure on beef in the study area

The distribution of the respondents according to their monthly expenditure on beef consumption in the study area is presented in table 3. The result shows that most (52%) of the respondents spend less than ₦1500 monthly on the consumption of beef. The table further

shows that 19.3%, 13.3%, 8.7%, 4.7% and 2% of the respondents spend between ₦1,500 – 2,999, ₦3,000 – 4,499, 4,500 – 5,999, ₦6,000 – 7,499 and ₦7,500 and above respectively on beef consumption monthly. The mean monthly expenditure on beef by the respondents is ₦2,663.00.

Table 3: Distribution of Respondents According to Their Monthly Expenditure on Beef in The Study Area.

Monthly Expenditure Ranges (₦)	Frequency	Percentage	Rank
≤1500	78	52	1 st
1500 – 2999	29	19.3	2 nd
3000 – 4499	20	13.3	3 rd
4500 – 5999	13	8.7	4 th
6000 – 7499	7	4.7	5 th
7500 – Above	3	2	6 th
Total	150	100	
Mean	₦2,663		

Constraints to Beef Consumption in The Study Area

Major constraints to the consumption of beef in the study area were presented in table 4 by the use of a 3-point Likert rating. The respondents all agreed that the constraints identified were serious with mean scores of cost price per kg

(2.54), proximity to source (2.29), lack of Abattoir (2.14), and lack of storage facility (2.31), financial status (2.39) and inadequate supply (2.34). It is only health condition and age were rejected with mean scores of 1.77 and 1.72 respectively.

Table 4: Constraints to Beef Consumption

Constraints	Very High Extent	High Extent	Very Low Extent	Total	Mean Score	Remark
Cost price per kg	98	36	16	382	2.54	Accepted
Proximity to the source	73	47	30	343	2.29	Accepted
Lack of abattoir	60	57	39	321	2.14	Accepted
Lack of storage facilities	61	74	15	346	2.31	Accepted
Health condition	42	31	77	265	1.77	Rejected
Financial status	81	47	22	359	2.39	Accepted
Inadequate supply	76	51	21	351	2.34	Accepted
Age	37	34	79	258	1.72	Rejected

Discussion

The finding of this study showed that there was more female patronage (purchase) of beef than males. This implies that women are usually more committed to kitchen and cookery activities in the family than men are. This agrees with the findings of Babayemi et al. (2017), who asserted that culturally, the wife has to go to the market, buy meat and prepare delicacies for the family while; the husband financially empowers the wife. The result further showed that the respondents were mostly middle-aged adults; hence, they are mostly in their productive years, which will enhance their economic activities and family food security. This finding agrees with Ekwe (2019) who asserted that most of the respondents are still at the productive age of 48 years and are still able to provide family food security.

The finding further showed that most of the respondents were married. This buttresses Ozor et al. (2015) assertion that marriage is vital in rural areas as it derives the support of their wives and children in agricultural production. The majority of the respondents indicated being full-time farmers. This gives credence to the finding of Akin-Olagunju and Omonona (2014) who reported that agriculture represents the main income source in the rural economy. The respondents had moderate household sizes. This indicates a useful source of labour for economic activities. Educationally, the study showed that most of the respondents had a maximum of secondary education, which indicates a good level of literacy among the respondents, which could enhance their consumption of beef. The respondents' level of income was low; implying that

their low level of income might affect their rate of beef consumption in particular and protein consumption in general. This result conforms with the view of Ekwe (2019) that a low income might affect the level of consumption of protein among rural farm households in Awgu, Enugu State, Nigeria.

The finding shows that beef generally was consumed occasionally among the rural households in the study area. This occasional consumption could be because of the cost of beef, its availability or the people's preference for fish as observed from the personal enquiry. This agrees with the findings of Akerele et al. (2015) who reported that the majority of the respondents in the Yewa South local government area of Ogun State, Nigeria prefer fish to beef as their source of protein. The form of beef mostly consumed by the respondents in this study was the boiled form followed by the fried form, and scarcely in roasted form. This may be because boiling and frying beef are easier and more convenient to carry out in the family kitchen, compared to roasting which requires special equipment that may not be easily available for family use.

The study further shows that the monthly expenditure on beef consumption in the study area was low. This result implies that on average, the respondents in the study area did not spend much on the consumption of beef. This could be because of the market price of beef, the respondents' monthly income and the availability of fish as the closest substitute for beef. This agrees with the reports of Akerele et al. (2015) and Ekwe (2019), that rural households in Yewa Local Government Area of Ogun State and Awgu

Agricultural Zone of Enugu State, Nigeria prefer fish as their main source of protein to beef. In support of these authors such as Oritse (2021), Karigidi (2021) and Igwe (2022) asserted that fish is currently the cheapest form of animal protein and that consuming fish in the right proportion is more beneficial to health compared to red meat and that about 40% of Nigerian protein intake is from fish.

The study also identified that the constraints to the consumption of beef in the study area included, the cost price of beef, proximity to the source, lack of an abattoir, lack of storage facility, financial status and inadequate supply of beef. However, the health condition and the age of the respondents were not barriers to the consumption of beef. This implies that the age of the respondents does not matter and the health condition of the respondents in the study area was not bad which can make them not eat beef. The cost price of beef being expensive agrees with the report of Olumide and Carlos (2017) in their work "Household demand for meat in Nigeria" that the price of beef was higher than that of chicken and mutton. In the same vein, the finding agrees with that of Akerele et al (2015) that the low availability of beef, distance to the source and lack of abattoir are the major constraints to beef consumption in Yewa South Local Government Area of Ogun State, Nigeria.

Conclusion and Recommendation

Beef was consumed occasionally among rural households in the study area, mostly in boiled and fried form. Roasted beef was scarcely consumed among the respondents. There was

more female patronage of beef than males probably because the women are more involved in kitchen and cookery activities in the family than the men are. The respondents in the study area did not spend much money on purchasing beef due to its high cost, scarce availability and people's preference for fish in the study area.

The study, therefore, recommends that:

- i. Extension and health workers should be well equipped to rightfully inform rural households of the importance and health benefits of beef consumption, as it is one of the main sources of animal protein.
- ii. Government should provide enabling environment that will encourage people to venture into cattle rearing and production by modernizing the current tiresome and archaic pastoral (nomadic) system of cattle production.
- iii. Construction of new and rehabilitation of old abattoirs and cold rooms should be carried out. This will help ensure the production and preservation of safe beef for consumption.
- iv. Recruitment and frequent training and retraining of beef inspectors/veterinarians and health workers should be carried out. This will help ensure the good production of safe beef for consumption.
- v. Entrepreneurs of cattle production should look beyond profit making and on consumer satisfaction. This will make them play their part in building a strong and healthy society.

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Nutritional Composition and Sensory Properties of Smoothies Produced from Pineapple (*Ananus Comosus*), Watermelon (*Citrus Lanatus Thumb*) and Mango (*Mangifera Indica L*)

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Abstract

Micronutrient deficiencies constitute an enormous global public health burden and increasing the consumption of fruit in form of smoothies can help alleviate this lingering problem. The study assessed the nutritional composition and sensory properties of various samples of smoothies produced from the combinations of pineapple (*Ananus comosus*), watermelon (*Citrus lanatus*) and mango (*Mangifera indica L*). The concentration of each of the fruits was varied in the three major samples while the control comprised an equal proportion of each of the three fruits. The smoothie samples were coded MWP, PMW, WMP and CONT according to the proportion of each fruit contained therein. Proximate, mineral and vitamin composition and sensory properties of the four smoothie samples were assessed using standard methods. The result of the proximate analysis showed that sample MWP contained the highest protein (2.76%) and fat (1.75%). Sample WMP had more ash (1.50%) content, while PMW had higher crude fibre and carbohydrate compositions (2.41 ± 0.00 mg) and (4.11 ± 0.70 %), respectively. The highest amount of calcium (74 ± 2.82 mg) and potassium (196.25 mg) were found in sample PMW, while WMP had higher iron (9.28 ± 0.03 mg). The sensory evaluation result showed that there was no significant difference in the colour, texture, flavour and general acceptability of the smoothies. The acceptance of smoothies coupled with their ability to furnish humans with essential nutrients shows that people can improve their dietary diversity and nutritional status through their consumption to remain healthy.

Keywords: Fruit smoothie, nutritional composition, sensory properties

Introduction

Fruits are the mature and ripened ovaries of flowers (Roth, 1977). They constitute an essential part of a healthy diet as they provide numerous health benefits including a reduction in the risk of non-communicable chronic diseases and the maintenance of normal body weight. The plausible explanation

for these advantageous effects can be attributable to the abundance of micronutrients (vitamins and minerals), phytochemicals, antioxidants, and fibre needed to make the human body function normally. Antioxidants inhibit or delay the oxidation of biologically relevant molecules either by specifically stopping free radicals or by chelation of

redox metals. Bailey et al. (2016) defined free radicals as highly unstable atoms, ions or molecules that actively react with other molecules and affect the normal functioning of the deoxyribonucleic acid (DNA) and cell membranes.

The fibre in fruits aids food digestion (Andreson et al., 2010), enhances nutrient absorption and reduces the acid load of the diet (Neul, 2010) and helps to maintain normal body weight (Tohill et al., 2014). Dietary fibre also reduces the risk of cancer, particularly that of proximal colon cancer and rectal cancer (Annema et al., 2011), and urothelial cell carcinomas (Ros et al., 2012); reduces cholesterol level (Southon, 2015); improves the health of the gut, which in turn decreases the prevalence of diverticulosis, constipation and diarrhoea (Klimenko et al., 2018). The World Health Organization (WHO) recommends that individuals should consume at least five servings or 400 g of fruits daily (WHO, 2020; Diaz-Garces et al., 2016). However, people in developing countries are expected to consume above this recommendation in the face of the nutrition transition that has culminated in a phenomenon referred to as the “triple burden” of malnutrition; undernutrition, micronutrient deficiencies and obesity.

Available literature still shows that people consume lower amounts of fruits (Global Burden of Disease Collaborators, 2019). Several factors may be responsible for the inadequate consumption of fruits. According to Fadeiye et al. (2019), factors such as personal likes and dislikes, taste, appearance, smell, health condition, season, available information, texture,

price and nutritional benefits, influenced the consumption of fruits. Some of these factors pose serious challenges to the consumption of healthy fruits by some individuals. However, these challenges, particularly those related to the organoleptic potentials and nutritional benefits of these fruits can be overcome through the production of smoothies from various fruits.

Smoothies refer to semi-liquid, fruit-based products with a smooth consistency that is prepared from a blend of different fruits in various proportions (Teleszko & Wojdylo, 2014). Smoothies can be produced from different fruits such as pineapple, watermelon, mango, banana and others depending on the availability and seasonality of the fruits and the preference of the consumer. Smoothies prepared from the combination of different fruits would supply more nutrients since no single fruit contains all the essential nutrients. In addition, many fruits are utilized in the production of smoothies to get a beverage with better organoleptic properties. As such, the present study utilized pineapple, watermelon and mango.

Pineapple contains calcium, potassium, carbohydrates, crude fibre and vitamin C (an effective antioxidant that aids the body's absorption of iron). It contains copper, which regulates the heart rate and blood pressure (Debnath et al., 2012). It is also a good source of manganese, a mineral that is required for building bones and connective tissues in the body (Hossain et al., 2015). The US Department of Agriculture [USDA], (2019) reported that watermelon is a rich source of energy

(30 Kcal), water (91.45 %) vitamin A (569 mg), vitamin C (8.1 mg), Lycopene (4532 µg per 100 g) among other vital nutrients. A hundred grams (100 g) of mango pulp contains 83.46 g of water, 60 kcal of energy, 14.98 g of carbohydrate, 0.82 g of protein, 0.38 g of lipid, 1.6 g of fibre, and 168 mg of potassium among other nutrients (Burton-Freeman et al., 2017; Dar et al., 2016; Maldonado-Celis et al., 2019; Tharanathan et al., 2006; USDA, 2020).

Following the composition of these three fruits, it is believed that their combination would improve the nutritional status of consumers. According to Hill (2020), there are three major types of smoothies which include: fruit smoothies, Green/vegetable smoothies and protein smoothies. Fruit smoothies usually contain one or more types of fruit blended with fruit juice, water or milk. Green smoothies are made from vegetables and fruit blended with water, juice or milk, while protein smoothies normally start with one fruit or vegetable and a liquid, and a major protein source like yoghurt cottage, cheese or protein powder. A fruit smoothie is considered to be one of the cheapest and most effective ways of increasing fruit intake.

Inadequate intake of fruits has many disadvantages which have been reported by several researchers. Micha et al. (2017) reported that low intake of fruit was responsible for 2 million deaths and 65 million Disability-Adjusted Life Years (DALY) in 2017 which was considered one of the leading dietary risk factors for deaths and DALYs globally and in many countries. Wang et al. (2021) found from two prospective cohort studies of US men and women and a meta-analysis of

26 cohort studies, that intake of at least 2 servings of fruits reduced mortality.

The Global Burden of Disease Collaborators (2019) showed that the consumption of fruits in sub-Saharan Africa was still inadequate. This is evident in the prevalence of micronutrient deficiencies across the globe, especially in developing countries like Nigeria. According to the Food and Agriculture Organization of the United Nations Statistics Division, FAOSTAT (2014), more than 2 million people worldwide suffer from hidden hunger. Evidence shows that 40-60% of under-five children in developing countries suffer from vitamin A deficiency (Mohammad (2018); 28 % of under-five children in Nigeria are iron deficient, 29.5 % are vitamin A deficient while 29.6 % suffer from iodine deficiency (Kuku-Shittu et al., 2016). It has been estimated that out of the 3.1 million child deaths that occur each year as a result of undernutrition, micronutrient deficiencies are responsible for 1.1 million deaths (Black et al., 2013).

Deficiency of iron, folic acid, iodine, vitamin A and zinc are the most common micronutrient deficiencies and can lead respectively to anaemia, neural tube defects, cognitive impairment, morbidity and mortality (Diedhiou & Jalal, 2015). These deficiencies affect mostly children, adolescent girls and pregnant women. Besides, various reviews have correlated low intake of fruits with the increasing prevalence of chronic non-communicable diseases such as cardiovascular diseases, low blood pressure, hypercholesterolemia, osteoporosis, cancers, chronic obstructive pulmonary diseases, respiratory problems and mental health

(Adebawo et al., 2012; Rosario et al., 2018).

Interventions to prevent micronutrient malnutrition, according to Miller and Welch (2013), can be categorised into three basic groups namely: (1) Agricultural production strategies, (2) Food processing strategies and (3) Economic and consumer education strategies. Others include food-based and micronutrient supplementation, food fortification, bio-diversification and dietary diversification through home gardens. Although micronutrient supplementation is generally preferred as a strategy to combat micronutrient deficiencies; they are most suitable when used as a measure to combat severe deficiencies. Food-based strategies such as food fortification and dietary diversification are more effective than micronutrient supplementation which should only be employed as a short-term measure. A basic tenet of a nutritionally adequate diet is that it must contain a variety of foods from all the food groups. The production of smoothies in this study was intended to promote dietary diversification among the population. Since smoothies can be used as a breakfast meal, they will encourage dietary diversity by helping people to incorporate more healthy foods into their diet and as such increase the intake of fibre, vitamins and minerals among other nutrients contained in them.

Objectives of the study: This study assessed the nutritional composition and sensory properties of smoothies produced from pineapple, watermelon,

and mango. The specific objectives of the study were to:

1. formulate smoothies from three different fruits;
2. determine their proximate composition;
3. determine their micronutrient composition (calcium, potassium, iron, pro-vitamin A and vitamin C) and
4. evaluate the sensory properties (colour, flavour, texture, taste, and general acceptability) of the smoothies

Materials and methods

Source of raw materials: The raw materials used for the production of smoothies were fresh ripe pineapple (*Ananas comosus*), watermelon (*Citrullus lanatus*) and mango (*Mangifera indica*). These fruits were procured from a local (Ogige) market in Nsukka Local Government Area of Enugu State, Nigeria.

Smoothie production: Fresh watermelon, mango and pineapple were selected and properly washed under running tap water, peeled using a sterile stainless knife and diced. Seeds were removed from the diced fruit pulps with a clean spoon. The diced seedless fruit was weighed with a food weighing scale and combined in the appropriate quantity of each of the fruits to get the ratios as presented in Table 1. The mixture was carefully poured into an aseptically hygienic Binatone 1.5L blender with Grinder BLG-410 to produce smoothie samples. The smoothies contained no additives such as sugar, water and/or acid. They were homogenized, bottled and kept in

the refrigerator until analysis was carried out.

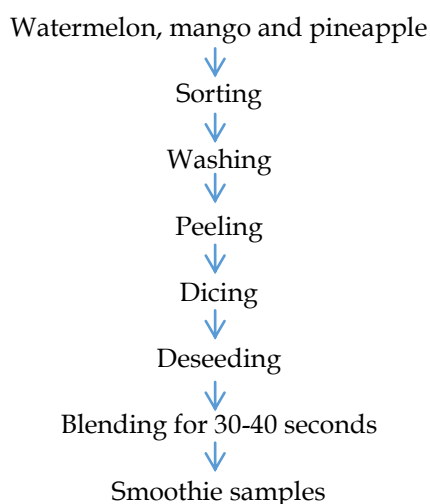


Fig 1: Flow chart of smoothie production

Table 1 presents the blending ratios of the smoothies. The smoothie sample coded MWP was made by combining 50 %: 25 %: 25 % mango: watermelon: pineapple. Sample code with PMW was in the ratio of 50 %:25 %:25 % pineapple: mango: watermelon. The sample coded WMP had 50 %: 25 %:25 % watermelon: mango: pineapple, while CONT which served as the control contained equal amounts (33.33 %: 33.33 %: 33.33 % mango: watermelon: pineapple) of the three fruits. The combination ratio was adapted from a previous work conducted by Victor-Aduloja et al. (2020). An equal amount of the three fruits was chosen to assess the preferred combination of these fruits as compared to the varying quantities.

Table 1: Blending ratios of fruits used for the production of smoothies (%)

Samples	Mango	Pineapple	Watermelon	Total
MWP	50	25	25	100
PMW	25	50	25	100
WMP	25	25	50	100
CONT	33.33	33.33	33.33	100

Source: Victor-Aduloja et al. (2020).

Proximate analysis: The proximate composition of samples of smoothies was determined using the air method described by the Association of Official Analytical Chemists of AOAC. The carbohydrate content was determined by difference. This means that the carbohydrate content of the smoothies was determined by subtracting the amounts of moisture, protein, fat, crude fibre and ash from 100%.

Mineral determination: The mineral components (potassium, iron, calcium) were analysed using the method described by the Association of Official Analytical Chemists of AOAC.

Vitamin determination: The vitamin components (vitamin C and beta-carotene) were analysed using the method described by the Association of Official Analytical Chemists of AOAC.

Sensory evaluation: The organoleptic test of the smoothies was done using a 9-point hedonic scale (Iwe, 2002). The panellists comprised thirty semi-trained students of the Nutrition and Dietetics Department, University of Nigeria, Nsukka. Each attribute was rated according to its intensity scaled on a 9-point hedonic scale quality with 9 = liked extremely, 8 = liked very much, 7 = liked moderately, 6 = liked, 5 =

neither like nor dislike, 4 = disliked moderately, 3 = disliked, 2 = disliked very much and 1 = disliked extremely.

Statistical analysis

The data obtained were statistically analysed using Statistical Product and Service Solution (IBM-SPSS) version 23. Descriptive statistics (means and standard deviations) were used to present the data. Analysis of variance (ANOVA) was used to compare the means of variables while the Turkey test was used to separate means. The significance level was accepted at $p < 0.05$.

Results

The proximate composition of the smoothie samples, presented as means and standard deviations, was shown in table 2. Moisture was significantly higher (90.80 ± 0.35 %) in WMP compared with other samples. The smoothie sample coded MWP had the highest protein (2.76 ± 0.18 %) and fat (1.75 ± 0.35 %) content. The crude fibre contents of the smoothies ranged from $2.41 \pm 0.00\%$ to $2.01 \pm 0.17\%$. The sample prepared with 50 % watermelon had the highest ash of 1.50 ± 0.00 % while the smoothie with 50 % pineapple contained more carbohydrates (4.11 ± 0.70 %) followed by CONT (3.07 ± 0.20), WMP (2.13 ± 0.23 %) and lastly MWP (2.08 ± 0.25 %).

Table 2: Proximate composition of smoothies made from mango, watermelon and pineapple (100 g wet weight)

Samples	Moisture (%)	Protein (%)	Fat (%)	Crude fibre (%)	Ash (%)	Carbohydrate (%)
MWP	90.40 ± 0.08^b	2.76 ± 0.18^c	1.75 ± 0.35^a	2.01 ± 0.17^c	1.00 ± 0.00^{ab}	2.08 ± 0.25^a
PMW	89.04 ± 0.35^{ab}	2.19 ± 0.00^{ab}	1.25 ± 0.35^a	2.41 ± 0.00^b	1.00 ± 0.00^{ab}	4.11 ± 0.70^b
WMP	90.80 ± 0.35^b	2.01 ± 0.12^a	1.50 ± 0.00^a	2.06 ± 0.00^a	1.05 ± 0.00^b	2.13 ± 0.23^b
CONT	90.51 ± 0.08^a	2.58 ± 0.07^{bc}	1.00 ± 0.00^a	2.09 ± 0.25^a	0.75 ± 0.35^a	3.07 ± 0.20^{ab}

Values = mean \pm standard deviation, Mean values on the same row with different superscripts were statistically different at $p < 0.05$, MWP = smoothie made from 50%:25%:25% of mango-watermelon-pineapple, PMW = smoothie made from 50%:25%:25% pineapple-mango-watermelon, WMP = smoothie made from 50%:25%:25% watermelon-mango-pineapple CONT = smoothie made from 33.33 % of mango, 33.33 % of watermelon and 33.33 % of pineapple

The mineral content of the smoothie samples was presented in Figure 1. Sample PMW had the highest calcium and potassium corresponding to 74 ± 2.82 mg and 196.25 ± 1.76 mg, respectively. The smoothie sample with

the code WMP contained the highest (9.28 ± 0.03 mg) amount of iron followed by CONT (9.10 ± 0.14 mg) followed by MWP (8.36 ± 0.30 mg) and lastly PMW (7.50 ± 0.03 mg).

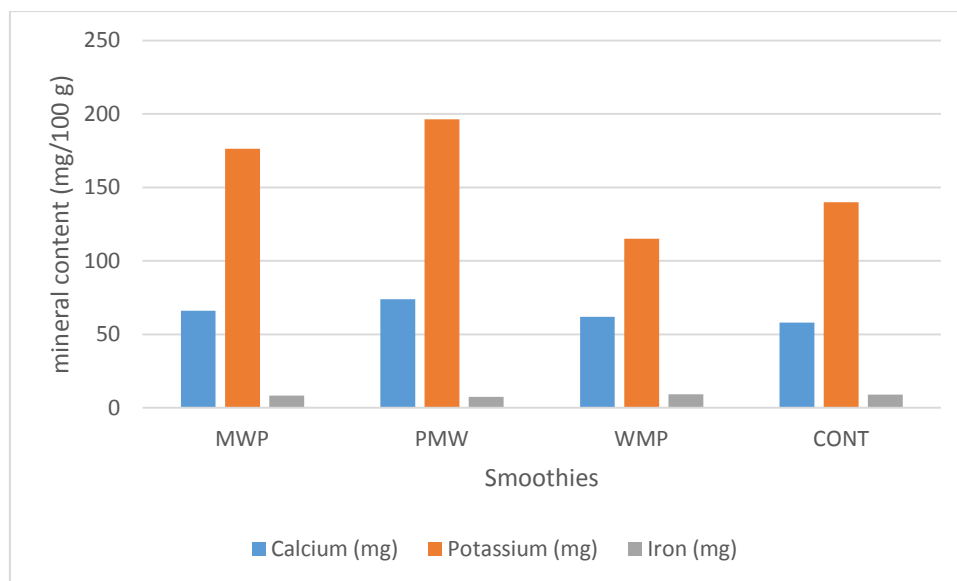


Figure 1: Mineral contents of the smoothies

Figure 2 presents the vitamin contents of the smoothie samples. All the samples contained appreciable amounts of Pro-vitamin A and vitamin C. There was a significant difference ($p < 0.05$) in the vitamin contents of the smoothies. Pro-vitamin A profile of samples WMP (459.57 ± 5.67 IU) was comparable to that

of the CONT (460.56 ± 11.01 IU), and both were significantly ($p < 0.05$) higher than the pro-vitamin contents of MWP and PMW. The Smoothie sample made from 50 % pineapple (PMW) had significantly ($p < 0.05$) higher vitamin C (346.50 ± 0.70) than the other samples.

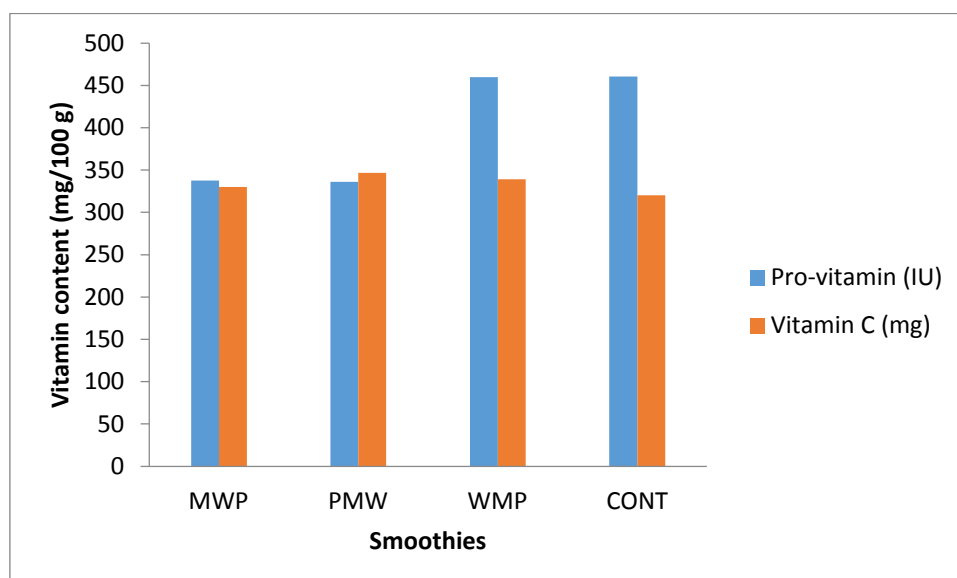


Figure 2: Vitamin contents of smoothies

The sensory scores (colour, texture, taste, flavour and general acceptability) of the smoothies are presented in table 5. The smoothie samples were not statistically different ($p > 0.05$) in all the sensory properties except in taste. The

control (CONT) was rated higher (7.55 ± 1.08) in taste followed by MWP (7.27 ± 1.78) and WMP (7.17 ± 1.14) which were also statistically the same, while PMW had the lowest taste score (6.47 ± 1.63).

Table 3: Sensory properties of smoothie made from mango, watermelon and pineapple

Sample	Colour	Texture	Taste	Flavour	General acceptability
MWP	7.83 ± 1.26^a	7.33 ± 1.09^a	7.27 ± 1.78^b	7.00 ± 1.53^a	7.07 ± 1.92^a
PMW	7.00 ± 1.78^a	7.00 ± 1.76^a	6.47 ± 1.63^c	6.27 ± 2.13^a	6.40 ± 1.94^a
WMP	7.63 ± 1.24^a	7.30 ± 1.26^a	7.17 ± 1.14^b	6.90 ± 1.44^a	6.57 ± 1.81^a
CONT	7.7 ± 1.13^a	7.17 ± 1.60^a	7.55 ± 1.08^a	6.97 ± 1.45^a	7.14 ± 2.18^a

Values = mean \pm standard deviation, Mean values on the same row with different superscripts were statistically different at $p < 0.05$, MWP = smoothie made from 50%:25%:25% of mango-watermelon-pineapple, PMW = smoothie made from 50%:25%:25% pineapple-mango-watermelon, WMP = smoothie made from 50%:25%:25% watermelon-mango-pineapple CONT = smoothie made from 33.33 % of mango, 33.33 % of watermelon and 33.33 % of pineapple.

Discussion

This study accessed the nutritional composition and sensory properties of smoothies produced from pineapple (*ananas comosus*), watermelon (*citrus lanatus thumb*) and mango (*mangifera indica*). The moisture content of the smoothie sample made from 50 % of watermelon was higher than others The high moisture content of this sample was not surprising because watermelon contains a lot of water. The result of the current study differed from the report of Aderinola (2018) who found lower moisture content within the range of 49.24 to 78.62 in a similar study. This difference in moisture content might be attributable to the different fruits (i.e., pineapple, banana and apple) used by the previous author which has less moisture than the fruits used in the current study. The protein and fat contents of the smoothies were generally low and these may be

attributable to the fact that fruits have low protein and fat contents. However, the sample made with 50 % mango, 25 % pineapple and 25 % watermelon had higher protein and fat compared to the other samples suggesting that this sample could be prescribed for individuals requiring to consume an appreciable amount of plant-based protein and fat. The protein value from the present study was lower than the protein values reported by Uzodinma et al. (2020) in a similar study on smoothies produced from pineapple, watermelon and banana. This may be attributable to the different kinds of fruits used in the two studies.

The lower crude fibre in sample MWP with a higher proportion of mango, was surprising because mango has been shown to contain a higher amount of fibre than watermelon and pineapple. Fruit fibres have been shown to reduce intestinal passage rates by

forming a bulk, leading to a more gradual nutrient absorption (Andreson et al., 2010), maintaining normal body weight (Schwingshacki et al., 2015), reducing blood cholesterol and oxidative damage (Southon, 2015). Smoothie prepared with 50 % pineapple had the highest carbohydrate value owing to the high (13.12 g) quantity of carbohydrates in 100 g of the fruits (USDA, 2019). Carbohydrate in the body plays a major role in providing readily available fuel for physical performance and regulating nerve tissues. However, the carbohydrate contents of smoothie samples in this study differed from the report of Uzodinma et al. (2020) who found as high as 18.79 % carbohydrate in their smoothie samples.

Smoothie sample containing more proportion of pineapple had significantly higher amounts of calcium and potassium and the lowest iron contents compared to its counterparts. Calcium plays a major role as a constituent of bones and teeth, regulation of nerve and muscle function and takes part in milk clotting; potassium is a major intracellular ion that aid in nerve transmission and muscle contraction (Gbarakoro et al., 2021). While the calcium content of this sample was expected to be higher than others, the highest amount of potassium in this sample was surprising as pineapple which constituted 50 % of this smoothie sample had the lowest (109 mg) quantity of potassium when compared with watermelon (112 mg) and mango that had 156 mg per 100 g pulp. The mineral composition of smoothies in this study did not agree with the report of Alake et al. (2022) who obtained higher values on the

production and evaluation of smoothies made from various fruits sold in the Lagos market. They showed that smoothies prepared with blends of watermelon and pineapple had 254.09 ± 0.28 and 54.45 ± 0.00 of calcium and iron, respectively. Conversely, the present study found higher potassium compared with Alake et al. (2022) who obtained lower potassium of 34.63 ± 0.01 mg/100 g. Reasons for the variation in the mineral composition of the smoothies might be a result of different methodologies and environmental conditions under which the fruits are grown and stored.

The vitamin content of the smoothies varied among samples. The control and the sample made with 50 % watermelon had the highest pro-vitamin contents while the sample produced from a greater percentage of pineapple had the highest vitamin C. The high vitamin C content of this sample was expected because pineapple has been shown to contain more of the vitamin compared to the other two fruits. Vitamin C is an important antioxidant that boosts the immune system and helps in the absorption of iron for the normal functioning of the body and the proper formation of collagen. Pro-vitamin is necessary for good eye health and improves the proliferation of red blood cells in the bone marrow. The high pro-vitamin of CONT and high vitamin C in PMW agrees with the report of Ufot (2018). In addition, Victor-Aduloju et al. (2020) reported higher vitamin A ranging from 466.00 ± 1.73 - 642.00 ± 1.73 IU and lower vitamin C ranging from 9.30 ± 0.00 - 10.67 ± 0.02 mg for their smoothie samples.

A sensory evaluation aims at measuring consumers' sensory

perception of products as well as the affective, emotional, and behavioural responses that arise from this perception (Delarue, 2022). The smoothies in this study had moderate to high acceptability in all the attributes evaluated. There was no significant difference among the colour, texture, flavour and general acceptability of the smoothie samples. However, the control sample had better taste than the other samples which were rated as similar in taste level. This indicated that projecting the individual taste of one fruit above others did not seem to yield the best acceptable taste of the smoothie, compared to a uniform blend of all the tastes as contained in the control sample. The result of the present study on the sensory properties of smoothies contradicted the report of earlier research by Dürschmid et al. (2009) where smoothies containing mango flavour were rated higher than other alternatives.

Conclusion

The study has provided baseline information on the nutrition composition and sensory properties of smoothies made from pineapple, watermelon and mango. The result demonstrated that the smoothie samples contained an appreciable amount of protein, crude fibre, carbohydrate, low fat, high content of pro-vitamin A, vitamin C, calcium, potassium and iron. In terms of the sensory evaluation, all the smoothies were equally accepted by the panellists, suggesting that people can use them as a way of diversifying their diet. Consumptions of the smoothie can contribute to the intake of healthier and nutritious beverages, thereby helping in

ameliorating the alarming increase of micronutrient deficiencies with their concomitant economic burden among the populace.

Recommendation

1. Since the consumption of smoothies is still evolving, people should be sensitized to the importance of smoothies as a good replacement for commercial drinks and beverages.
2. Further studies are required to determine the self-life, microbial load, and anti-nutritional composition of these smoothies

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Nutrient and Phytochemical Composition of *Telfairia Occidentalis* Seed Processed by Boiling, Roasting and Fermentation Methods

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Abstract

This study assessed the nutrient and phytochemical composition of *Telfairia occidentalis* seed processed by fermentation, roasting, and boiling. The seeds were obtained from three local markets in Enugu State. A total of three samples were prepared using the three selected processing methods. The nutrient and phytochemical composition of the processed samples were analysed using standard procedures. Data were analysed as mean and standard deviation using Statistical Product for Service Solution (SPSS) Version 23.0. Analysis of variance (ANOVA) was used to compare means while Duncan's Multiple range test was used to separate significant means at $P < 0.05$ level of significance. Samples were brought to the same moisture level before analysis. The proximate composition of the samples showed that seeds subjected to roasting had higher carbohydrate (54.88%) levels, while boiled seeds had the highest protein contents (23.12%). Mineral compositions of the seeds showed that magnesium was 58.8% in fermented seeds, 43.20% in boiled seeds, and 52.20% in roasted seeds. Calcium content was 20.0% in fermented seeds, 68.00% in boiled seeds, and 32.00% in roasted seeds. The fermented seeds were higher in vitamin A (21.42ug) and vitamin B9 (58.53mg) but lower in vitamin B₂ (0.09mg) and B₃ (0.72mg). Phytochemical levels of the seeds showed that the fermented seeds were lower (2.20%) in saponin and flavonoid (1.00%) but higher in alkaloids (9.00%) than the other samples. The fermentation method had the least effect on the nutrient and phytochemical composition of the *Telfairia occidentalis* seed.

Keywords: phytochemicals, processing methods, nutrient contents, fluted pumpkin seed

Introduction

Fluted pumpkin (*Telfaria occidentalis* Hook F.) is a creeping vegetable herb that spread on the ground with large lobbed leaves and long twisting tendrils. Its habitat is the wet part of Nigeria and Africa in general (Horsfall & spiff, 2005), it also belongs to the family cucurbitaceae (Ehiagbonase, 2008). Common names of the plant

include fluted gourd, and fluted pumpkin, it is also known as ugu, among the Igbos in Nigeria. The seeds contain 13% oil and are used for cooking and other culinary purposes. This oil of *Telfaria occidentalis* seeds has high iodine and a high content of unsaturated fatty acids when compared to palm oil (Aaron, Ukam, & Markson, 2017).

Food processing helps to sterilize it by killing harmful bacteria and other microorganisms and increasing the availability of nutrients, however, processing may reduce the nutritional value of some foods as a result of losses and changes in major nutrients, including proteins, carbohydrates, minerals and vitamins (Ibironke & Owotomo, 2020). It includes cooking, dehydration, drying, freezing and hot dry heating. Processing of food can improve the digestibility of the food, it can also improve taste, aroma, palatability and also its keeping quality (Ibironke & Owotomo, 2020). Removal of undesirable components in pumpkin seeds is essential to improving the nutritional quality of foods and effectively utilizing their full potential as food ingredients (Aaron, Ukam, & Markson, 2017).

Even though fluted pumpkin seeds are very nutritious and a lot of people consume it, however, when fluted pumpkin seeds are not properly processed they can be harmful to the body, these can be removed by washing, soaking and parboiling (Kuku, Etti & Ibronke, 2014). In addition, when fluted pumpkin seeds are over-processed or under-processed, it loses its nutrient. Therefore, there is a need to determine the best processing method that will retain more nutrients and improve the nutritional quality of fluted pumpkin seed to successfully utilize its full potential as a food ingredient.

Objectives of the study: The broad objective of this study is to evaluate the chemical composition of processed fluted pumpkin seeds. The specific objectives are:

- i. to determine the proximate composition of processed fluted pumpkin seed;
- ii. to determine the phytochemical properties of processed pumpkin seed;
- iii. to evaluate the contents of the vitamin in fluted pumpkin seed;
- iv. to evaluate the mineral contents of fluted pumpkin seed;

Materials and methods

Study design: This study employed an experimental design

Procurement of raw materials: Matured fluted pumpkin (*Telfairia occidentalis*) fruits were obtained from farmers from different local markets in Enugu State.

Sample preparation: Fluted pumpkin seeds were extracted from the fruits. The fresh mature seeds were washed to remove dirt and foreign particles. The seeds were then divided into three equal parts each weighing 500g. The first part of the seeds was roasted in the oven at 160°C for 30 min. The second part was boiled at 100°C for 30 min, drained, and allowed to cool. The third part was subjected to fermentation. This was done by first boiling the seeds for 30 minutes and then wrapping the boiled seeds in blanched banana leaves and allowing them to ferment naturally for 72 hrs. All samples were thereafter grounded separately using an electric grinder (Binatone, 300w; 1.8l blender), packaged separately in a well-labelled airtight container and stored under refrigerating temperature (-4°C) until analysis, adopted from Kuku et al., (2014)

Chemical analysis: Chemical analysis was carried out in duplicates for all parameters

Proximate composition: The moisture content of the sample was determined using the hot air oven method (AOAC, 2010). Ash determination was carried out using the standard procedure of the Association of Official Analytical Chemists (AOAC, 2010). The micro Kjeldahl method described by AOAC (2010) was used for crude protein determination. The crude fibre was determined using the aid and alkaline digestion method (AOAC, 2005). The standard AOAC (2010) method was used for crude fat determination. The total carbohydrate was obtained by difference: 100%- (% Moisture + % crude protein + % crude fat + % crude fibre + % Ash)

Vitamin analysis: Vitamin C (ascorbic acid) was determined using the standard AOAC (2010) method. The quantity of beta-carotene in the samples was determined using the Harbone method as described by Jakutowicz et al. (1997). Riboflavin (Vitamin B₂) was determined using the standard method described by AOAC (2006). Niacin (Vitamin B₃) was determined using the spectrophotometric method described by AOAC (2010). Folate (Vitamin B₉) was determined using the standard method described by AOAC (2005).

Mineral analysis: Calcium was determined using the dry ashing method described by AOAC (2010). The standard AOAC (2010) method was used to determine the iron content of the sample. The formula for sodium and potassium determination:

$$\text{Ppm} = \frac{\text{Gf} \times \text{Total volume of extract} \times \text{Ab}}{\text{DF} / \text{Weight of sample}}$$

Where;

DF = Dilution factor, GF = Gram factor, Ab = Absorbance

Magnesium determination: After acid digestion of the sample, the magnesium content was then determined by atomic absorption spectrophotometer as described in the official method of the Association of Official Analytical Chemists (AOAC, 2010).

Phytochemical analysis: Total Saponin content was determined by using the spectrophotometric methods described by (Pearson, 1976). Alkaloid content was determined by the alkaline precipitation-gravimetric method described by Harborne (1973). Flavonoid was determined using the Boham and Kocipai-Abyazan (1994) method.

Statistical analysis

Data collected were statistically analysed using Statistical Product and Service Solution (SPSS version 23.0). Descriptive statistics (means and standard deviations) were used to present the data. Analysis of Variance (ANOVA) was used to compare the means of variables. Duncan Multiple Range test (DMRT) was used to separate means at a 5% probability level ($p < 0.05$).

Results

Table 1 shows the proximate composition of processed fluted pumpkin seed. The moisture contents of the samples ranged from 16.00% in boiled fluted pumpkin (FF2) to 64.50% in roasted fluted pumpkin (FF3). The fat content ranged from 2.00% in FF2 to 3.50% in fermented fluted pumpkin (FF1) and FF3 respectively. The fibre content of the samples was highest (13.50%) in FF3 and lowest (2.00%) in FF1. The protein contents of the samples

ranged from 11.12% in FF2 to 23.12% in FF1. The ash content ranged from 2.00% in FF3 to 3.50% in FF1 and FF2 while the carbohydrate content varied from 2.58%

in FF3 to 54.88% in FF2. Statistically, there were significant differences ($P < 0.05$) in all the proximate parameters, except in fat and ash.

Table 1: Proximate composition of processed fluted pumpkin seed

Sample	Moisture (%)	Fat (%)	Crude fibre (%)	Protein (%)	Ash (%)	CHO (%)
FF1	56.50±0.71 ^b	3.50±0.71 ^a	2.00±0.57 ^a	23.12±0.49 ^c	3.50±0.71 ^a	11.38±0.35 ^b
FF2	64.50±0.71 ^c	3.50±0.71 ^a	13.50±0.14 ^b	13.92±0.13 ^b	2.00±0.00 ^a	2.58±0.40 ^a
FF3	16.00±0.00 ^a	2.00±0.00 ^a	12.50±0.71 ^b	11.12±0.86 ^a	3.50±0.71 ^a	54.88±0.28 ^c

Values are Means ± SD (standard deviation) of duplicate determination. Means on the same column with different superscripts are significantly different at $p < 0.05$. Key: FF1= fermented fluted pumpkin, FF2= boiled fluted pumpkin, FF3= roasted fluted pumpkin

Table 2 shows the mineral contents of processed fluted pumpkin seed per 100g. The magnesium content of the samples ranged from 43.20mg in FF2 to 58.80mg in FF1, the mean Magnesium differed significantly ($P < 0.05$) in all the samples. FF2 had the least magnesium content while FF1 had the highest magnesium content. The calcium contents of the samples ranged from 20.0 mg in FF1 to 68.00 mg in FF2. The

potassium content ranged from 0.76 mg in FF1 to 1.20 mg in FF3. FF1 had the least potassium content while FF3 had the highest potassium content. The iron content of the samples was highest in FF2 (0.31 mg) and lowest in FF1 (0.20mg). Statistically, there was no significant difference ($P > 0.05$) between FF1 and FF2 in their potassium content and between FF1 and FF3 in their calcium and iron contents.

Table 2: Mineral contents of processed fluted pumpkin seed per 100g

Sample	Magnesium (mg)	Calcium (mg)	Potassium (mg)	Iron (mg)
FF1	58.80±1.70 ^c	20.0±5.66 ^a	0.76±0.06 ^a	0.20±0.32 ^a
FF2	43.20±1.80 ^a	68.00±5.66 ^b	0.90±0.00 ^a	0.31±0.02 ^b
FF3	52.20±0.85 ^b	32.00±0.00 ^a	1.20±0.14 ^b	0.25±0.01 ^{ab}

Values are Means ± SD (standard deviation) of duplicate determination. Means on the same column with different superscripts are significantly different at $p < 0.05$. Key: FF1= fermented fluted pumpkin, FF2= boiled fluted pumpkin, FF3= roasted fluted pumpkin

Table 3 presents the vitamin contents of processed fluted pumpkin seed per 100g. The beta carotene content of the samples was highest (21.42 µg) in FF1 and lowest (19.93µg) in FF2 and FF3. The vitamin B₂ content of the samples ranged from 0.09 mg in FF3 to 0.79 mg in FF2. The vitamin B₉ content ranged

from 14.20 mg in FF2 to 58.53 mg in FF1. The vitamin B₃ content was highest in FF1 (3.39 mg) and lowest in FF3 (0.72 mg). Statistically, there was a significant difference ($P > 0.05$) in the vitamin contents of the samples. However, the beta-carotene contents of FF2 and FF3 were comparable at $P > 0.05$.

Table 3: Vitamin contents of processed fluted pumpkin seed per 100g

Sample	Beta-carotene (µg)	Vitamin B ₂ (mg)	Vitamin B ₉ (mg)	Vitamin B ₃ (mg)
FF1	21.42±0.20 ^b	0.56±0.06 ^b	58.53±1.47 ^c	3.39±0.06 ^c
FF2	19.93±0.30 ^a	0.79±0.01 ^c	14.30±3.16 ^a	1.12±0.01 ^b
FF3	19.93±0.30 ^a	0.09±0.05 ^a	36.57±0.36 ^b	0.72±0.06 ^a

Values are Means ± SD (standard deviation) of duplicate determination. Means on the same column with different superscripts are significantly different at $p < 0.05$. **Key:** FF1= fermented fluted pumpkin, FF2= boiled fluted pumpkin, FF3= roasted fluted pumpkin

Table 4 presents the phytochemical contents of traditionally processed fluted pumpkin seed per 100g. The saponin content of the samples ranged from 2.20% to 19.70%. FF1 had the least saponin content while FF3 had the highest saponin content. The flavonoid

content ranged from 1.00% in FF1 to 3.50% in FF2 and FF3 while the alkaloid content ranged from 6.00% in FF3 to 11.00% in FF2. Statistically, there was no significant difference ($P > 0.05$) in the flavonoid content of the samples.

Table 4: Phytochemical contents of processed fluted pumpkin seed per 100g

Sample	Saponin (%)	Flavonoid (%)	Alkaloid (%)
FF1	2.20±0.28 ^a	1.00±0.00 ^a	9.00±0.01 ^b
FF2	12.40±0.00 ^b	3.50±0.71 ^a	11.00±0.20 ^c
FF3	19.70±0.14 ^c	3.50±3.54 ^a	6.00±0.00 ^a

Values are Means ± SD (standard deviation) of duplicate determination. Means on the same column with different superscripts are significantly different at $p < 0.05$. **Key:** FF1= fermented fluted pumpkin, FF2= boiled fluted pumpkin, FF3= roasted fluted pumpkin

Discussion

The proximate composition of the processed fluted pumpkin seed revealed that the sample had low-fat content. The fat content of fluted pumpkin seed was observed to reduce during various processing. It may be suggested that the shelf life of pumpkin seed flour will be prolonged as the rate of rancidity will be slow and also contribute to the low energy of the samples (Fasasi, 2009). Kuku, (2014) also carried out a similar study; however, her findings showed that fat was not affected by boiling. But this disagrees with the study done by Alozie et al., (2017) whose fat contents were high, especially unsaturated fatty acids.

The crude fibre content was low. This is similar to the findings of Hamilton

(2021). The quantity of crude fibre was not affected by dry heat (roasting) and boiling of pumpkin seeds, however, the reduction of crude fibre during fermentation in the study is likely a result of the breakdown of the fibre by the micro-organisms involved in the fermentation process or through conversion of carbohydrate and lignocelluloses into protein (Aaron et al., 2017). A low level of crude fibre also suggests that the pumpkin seeds are suitable for formulating baby's food, for they do not need an excessive intake of dietary fibre (Eneobong, 2001).

The protein analysis indicated that the fluted pumpkin seed contains an appreciable amount of protein. According to a study done by Fagbemi, (2007), fermentation had the highest

crude protein content of fluted pumpkin seed, followed by the boiled sample, while the roasted sample had the least. Protein is high in pumpkin seeds assessed with increasing duration of fermentation. Similar results were also obtained by (Aaron et al., 2017). Onimawo and Akubor (2012) suggested that the increases in protein observed during fermentation might result from the degradation of stored proteins and other materials during fermentation.

The percentage of carbohydrates also showed that the products contained a high quantity of carbohydrates. The study carried out by Christian (2007) agrees with this study which shows that the seed contained high carbohydrates. Carbohydrates are energy-giving macronutrient which is required for various body metabolisms. Nwaigwe and Adejumo (2015) asserted that shorter processing time results in higher carbohydrate yields.

Fermented fluted pumpkin had the highest amount of magnesium, while boiled fluted pumpkin had the least amount of magnesium. This disagrees with the study done by Akintade et al., (2019) with lower magnesium content for fermented, boiled and roasted seeds. Ibironke and Owotomo (2019) confirmed that magnesium helps the brain and nervous system, improving cognitive reasoning, memory loss (Dementia) and other health conditions associated with memory health such as Alzheimer's disease. Magnesium is a cofactor required for the movement of glucose into the cell and for carbohydrate metabolism. It is involved in the cellular activity of insulin. Low magnesium intake is a risk factor for diabetes (Lopez-Ridaura, et al., 2004). Magnesium deficiency inhibits cellular

defences against oxidation damage, which in turn results in a decreased resilience to the oxidative stress caused by diabetes, thereby expediting the progression to diabetes-related complications.

The calcium contents of the samples were high. This agrees with the study conducted by Boraso (2002) which showed high content of calcium in processed fluted pumpkin seed. Calcium is a vital mineral for bone growth and muscle and neurological function. The daily requirement of calcium is 1200 mg until the age of 24 years, so an adequate consumption of *Telfairia occidentalis* (approximately 1kg) per day would satisfy about one-fourth of this requirement (Agathemor, 2006) functions. The concentration of calcium (280.44 mg/L) obtained in this study can supply about one-third of the daily requirement of man.

The potassium content of the fluted pumpkin was low. This disagrees with the finding of Akintade et al (2019) work which showed higher potassium content. Potassium is one of the minerals that keep the bone intact and prevent the leaching of the mineral. It also prevents osteoporosis which is characterized by low bone mass and results in vulnerability to fracture (Adefisola et al, 2019; Ibironke et al., 2017).

The iron content of the fluted pumpkin seed was low and the iron content is lower than the value reported by Longe et al., (2008) and Akintade (2019) and thereby disagrees with the study. Iron is important for haemoglobin formation.

The vitamin A (Beta-carotene) content of the samples were low. The study by Kayode (2019) disagrees with

this study which has a vitamin A content of 890ug. β -Carotene is one of the plant carotenoids converted to vitamin A in the body. In the conversion of Vitamin, A, β -carotene performs many functions in overall health; It works most efficiently in combination with other carotenoids and has been found to reduce the risk of lung and colon cancer. Pumpkin also has a huge concentration of β -carotene which protect against certain cancers and cataract and is a powerful ally against the degeneration aspect of ageing. Carotenoids are the primary source of vitamin A.

The vitamin B2 content of the fluted pumpkin seed was low. This agrees with a study conducted by Okpalamma et al., (2013). it also agrees with the study done by Orole, (2020) which showed that vitamin B2 contents were low. The vitamin B9 result revealed appreciable amounts of vitamin B9 and minimal concentrations of vitamin B3. This disagrees with the study conducted by Okpalamma et al, (2013), and research by Orole (2020) disagrees with this study.

The saponin content of the samples was appreciable. This disagrees with the study by Orole et al, (2020) which had a low saponin value. Most seeds contain Saponins as their main ingredient. One useful type of saponin for skin care is triterpenoid saponin, which can be found in herbs such as Licorice root (*Glycyrrhizaglabra*). This particular saponin can aid the absorption of nutrients. High level of saponin has been associated with gastroenteritis manifested by diarrhoea and dysentery, but it was reported that saponin reduces body cholesterol by preventing its re-absorption and suppressing rumen

protozoan by reacting with cholesterol in the protozoan cell membrane thereby dissolving it (Ganiyu, 2005).

The flavonoid content of the samples was low. This is comparable with research conducted by Orele et al, (2020). Flavonoids are particularly useful for maintaining healthy circulation and some are antioxidant, while others are anti-inflammatory, anti-viral or capillary strengthening (Ejidike & Ajileye, 2007). The alkaloid content of the samples was high compared to the findings of Enujiugha et al. (2014) who reported a lower (0.350 mg/g) alkaloid content of *Telfairia occidentalis* aqueous extracts in a similar study.

Conclusion

The processing method is considered acceptable when it retains or leads to an increase of nutrients and lowers toxic components in the food materials processed. From the findings of this study, fermentation has proved the best method of processing seeds of fluted pumpkin for consumption as it has led to the retention of higher amounts of some nutrients like protein, moisture, carbohydrates, magnesium, calcium, vitamin A and vitamin B9 than boiling and roasting methods of processing.

Recommendation

1. Nutritionists should create awareness among the public on the importance of using the best processing method (fermentation) that will ensure optimum nutrient retention in processing fluted pumpkin seeds.
2. People should be encouraged to consume fluted pumpkin seeds because the result of the study has shown that it is nutrient dense.

3. More studies should be done to know if fluted pumpkin seed can be used to formulate baby food, due to its low fibre content.

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Mental Health Improvement: The Roles of Foods and Food Scientists

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Abstract

Mental health (MH) is a wide range of conditions that affect the mood, thinking, behaviour, emotions and social well-being of people. Mental health conditions such as depression and anxiety affect a significant number of people. It is estimated that about 300 million people suffer from poor mental health worldwide. The most common types of poor MH are depression and anxiety. Outside the traditional functions of food, studies have shown a strong link between food and mental health. Foods that improve MH are associated with the Mediterranean diet such as fruits and vegetables, whole grains, cereals, nuts, seeds and among others. Mushrooms, healthy fats, and fermented foods are other foods that improve mental health. Foods that have negative effects on MH include refined carbohydrates, highly saturated oils and excess intake of alcohol. Food Scientists have important roles to play in mental health improvement. These roles include proper handling and storage of foods, use of minimal processing methods to reduce nutrient loss, use of healthy fats/oils i.e. those rich in polyunsaturated fatty acid, and food fortifications among others. It is recommended that Food Scientists should make use of those ingredients that improve MH during food processing and at the same time reduce those that negatively affect mental health. More research on the role of foods in MH improvement and strategies for using foods to improve mental health challenges should be conducted. Food Scientists should also strive to establish strong links and collaborations with major stakeholders in the food and health sectors.

Keywords: mental health, foods, food processing, Food Scientists

Introduction

Mental health is a wide range of conditions that affect mood, thinking and behaviour. It also includes emotional, psychological, and social well-being. Mental health (MH) affects how one thinks, feels, and acts. It also determines how one handles stress, relates to others, and makes choices (National Centre for Chronic Disease

Prevention and Health Promotion, Division of Population Health, 2021). MH is important at every stage of life, from childhood and adolescence through adulthood. Mental health is vital to the successful performance of mental functions resulting in productive activities, fulfilling relationships, and being able to adapt to change and cope with

adversities (Firth et al., 2019). Mental illness on the other hand is the opposite of mental health.

The term “mental illness” collectively refers to all diagnosable mental disorders. Mental illness is characterized by some combination of abnormal thoughts, emotions, behaviour and relationships with others (Department of Health and Human Services, 1999). Following WHO’s International Classification of Diseases (ICD-10), a mental disease is a broad definition for health disorders (depression, anxiety, bipolar, eating disorders and schizophrenia) and substance use (alcohol and drug use disorders), as well as neuro-developmental disorders, including autism, attention-deficit hyperactivity disorders (ADHD) and developmental disability (WHO, 1997). The determinants of poor mental health are not only related to individual capabilities of coping with emotional challenges but also include social, political, environmental, working conditions and community support. Stress, genetics, nutrition, perinatal infections and exposure to environmental hazards are contributing factors to mental disorders. Mental health and physical health are closely linked.

Mental health and physical health are closely connected. Mental health plays a major role in a person’s ability to maintain good physical health. Mental disorders, such as depression and anxiety, affect a person’s ability to participate in health-promoting behaviours. In turn, problems with physical health, such as chronic diseases, can have a serious impact on mental health and decrease a person’s

ability to participate in mental health treatment and recovery (US Dept of Health and Human Services, n.d). It has been reported that in 2019, nearly a billion people, including 14% of the world’s adolescents, were living with a mental disorder. Suicide accounted for more than 1 in 100 deaths, with 58% of suicides occurring before age 50 (WHO, 2022). The prevalence of mental health disorders has increased in both developed and developing countries. Modern populations are increasingly overfed, malnourished, sedentary, sunlight-deficient, sleep-deprived, and socially isolated. These changes in lifestyle contribute both to poor physical health and the incidence and treatment of depression (Hidaka, 2012). However, the four most common mental illnesses that cause disabilities are major depression, bipolar disorder, schizophrenia, and obsessive-compulsive disorder (Murray & Lopez, 1996). The mental health scenario in developing countries is further worsened by the high poverty levels. Significant associations between poverty indicators and common mental disorders have been reported (Patel & Kleinman, 2003),

Typically, most of these mental illnesses are treated with prescription drugs, unfortunately, many of these prescribed drugs cause unwanted side effects. For example, lithium is usually prescribed for bipolar disorder, but the high doses of lithium that are normally prescribed causes side effects that include: a dulled personality, reduced emotions, memory loss, tremors, or weight gain (Waring, 2006; Vieta & Rosa, 2007). These side effects can be so severe and unpleasant that many patients become noncompliant and, in

cases of severe drug toxicity, the situation can become life-threatening. There is, therefore, the need for alternative preventive measures or new treatment approaches such as the use of foods to tackle mental illness mostly characterised by depression and anxiety.

Over the past decade, there has been a steady increase in epidemiological studies investigating the relationships between dietary patterns and mental states. Some nutritional deficiencies correlate with mental disorders. The most common nutritional deficiencies seen in mentally ill patients are omega-3 fatty acids, B vitamins, minerals, and amino acids that are precursors to neurotransmitters (Rao et al., 2008). Therefore, foods, diets, and dietary supplements are identified as complementary and alternative medicine (CAM) approaches to mental health management (Briguglio et al., 2019). Food Scientists by their profession have critical roles to play in CAM. This paper, therefore, seeks to review the established relationships between MH and food while highlighting the roles of Food Scientists in MH improvement.

Relationship between food and mental health

In recent years, the relationships between food and mental health have gained considerable interest. Food has been recognized to affect mood depending on the availability of neurotransmitter precursors (Choi et al., 2011) and recompensing mechanisms. Food contains macronutrients; carbohydrates, proteins and fats, micronutrients; minerals and vitamins. Any deficiency of nutrient intake

sustained for a sufficiently long enough term can create physical and psychological disorders. As with any other organ, the brain is nurtured with substances present in the diet. Therefore, the nutritional properties of food impact brain functions related to mood and emotion.

Epidemiological research has observed that adherence to healthy or Mediterranean dietary patterns is associated with a reduced risk of depression and improved MH (Lassale et al., 2019). These diets include; plenty of fruits and vegetables, whole grains, potatoes, cereals, beans and pulses, nuts and seeds and olive oil. Low-to-moderate amounts of dairy products, fish, and poultry, little red meat, eggs up to four times a week, and low-to-moderate amounts of wine (Lassale et al., 2019). It has also been proved that chocolate if eaten in sufficient amounts on an empty stomach, might encourage the synthesis of serotonin (Shepherd & Raats, 2006). The neurotransmitter serotonin (or 5-hydroxytryptamine; 5-HT) is formed from the precursor essential amino acid, tryptophan (TRP) in the presence of an enzyme - tryptophan hydroxylase, which converts TRP to 5-hydroxytryptophan. Abnormal levels of 5-HT have long been involved in sleep, as well as in affective disorders such as depression and anxiety. Serotonin and tryptophan are known to promote well-being (Constantin & Fonseca 2020).

Protein intake affects brain functioning and mental health. The neurotransmitters that impact mood are made of amino acids and proteins. The neurotransmitter, dopamine is made from the amino acid tyrosine, and the neurotransmitter serotonin is made

from tryptophan. The limitation of these amino acids leads to the poor synthesis of the neurotransmitters and hence to low mood, whereas the excess may lead to brain damage and mental retardation (Rao et al., 2008). Foods containing tryptophan increase serotonin levels in the brain and alter neural processing in mood-regulating neurocircuits. However, tryptophan competes with other large-neutral-amino-acids (LNAA) for transport across the blood-brain barrier, a limitation that can be mitigated by increasing the tryptophan/LNAA ratio. The LNAA include tyrosine, threonine, methionine, valine, isoleucine, leucine, histidine and phenylalanine.

The results of an experiment that increased the tryptophan/LNAA ratio in a customised drink suggest that this can lift disposition by affecting mood-regulating neurocircuits (Kroes et al., 2014). On the other hand, excess consumption of amino acids may exacerbate brain damage. It has been confirmed that excess phenylalanine in individuals can cause a disease known as phenylketonuria which can subsequently lead to brain damage and mental retardation (Rao et al., 2008). Further experimental studies have revealed that diets lacking omega-3 PUFA lead to considerable disturbance in neural function (Sinclair et al., 2007). This is because the brain is a fat-rich organ, the lipidic brain membrane contains phospholipids, sphingolipids, and cholesterol. It has been estimated that the brain's grey matter contains 50% fatty acids that are polyunsaturated (PUFA), out of which 33% belong to the omega-3 family (Rao et al., 2008).

A deficiency in omega-3 fatty acids would naturally harm brain function.

Omega-3 (n-3) PUFAs, including alpha-linolenic acid (ALA), eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), produce n-3 eicosanoids which have anti-inflammatory action. On the contrary, PUFAs, such as linoleic acid and arachidonic acid, produce n-6 eicosanoids which are generally pro-inflammatory (Schmitz & Ecker, 2008). Clinical and epidemiologic studies suggest that inadequate dietary n-3 polyunsaturated fatty acids (PUFA) may increase predisposition to several psychiatric disorders, particularly depression (McNamara & Carlson, 2006).

Western-style diets are low in omega-3 fatty acids, including the 18-carbon omega-3 fatty acid alpha-linolenic acid found mainly in plant oils, and DHA, which is found mainly in fish (Innis, 2008). Compelling population studies link high fish consumption to a low incidence of mental illness; this lower incidence rate has proven to be a direct result of omega-3 fatty acid intake which is sufficient in fish oils (Reis et al., 2006; Tanskanen et al., 2001). One to two grams of omega-3 fatty acids taken daily is the generally accepted dose for healthy individuals, but for patients with mental illness, up to 9.6 g is safe and efficacious (Von Schacky, 2006).

Depressive symptoms are the most common manifestation of micronutrient deficiency such as folate (vitamin B₉). Patients with depression have 25% lower blood folate levels than healthy subjects. Folic acid deficiency causes serotonin levels in the brain to decrease. Psychiatric patients with depression have much higher rates of folic acid deficiency than the general public (Williams et al., 2005). Vitamins B₆ and

B₁₂, among others, are directly involved in the synthesis of some neurotransmitters (Rao et al., 2008). Supplementation with cobalamin (B₁₂) improves cerebral and cognitive functions and preserves the integrity of the myelin sheath of the nerve fibres (Rao et al., 2008). Individuals suffering from a lack of selenium are more anxious, irritable, hostile, and depressed than their non-lacking counterparts (Nirav, 2013).

Foods that Promote Mental Health Wellness

Mushroom: Mushrooms belonging to species of *Termitomyces*, *Pleurotus*, *Lentinus*, *Lenzites*, *Trametes*, *Ganoderma*, *Pycnoporus*, *Coriolopsis*, and *Calvatia* have been reported to be used in folk medicine in West Africa (Barros et al., 2018). Numerous studies have provided insights into the neuroprotective effects of medicinal mushrooms, which are attributed to their antioxidant, anti-neuroinflammatory, cholinesterase inhibitory and neuroprotective properties (Badalyan & Rapior, 2021; Lew et al., 2020). Mushrooms are rich in glutamic acid, an amino acid which also acts as a neurotransmitter. They are also the highest dietary source of amino acid, ergothioneine; an anti-inflammatory substance which cannot be synthesized by humans (Kalaras et al., 2017). It has been shown that ergothioneine can help lower the odds of people developing schizophrenia, bipolar disorder and depression. Some mushrooms known as "magic mushrooms", naturally contain psilocybin, a hallucinogenic substance that may be as active as an antidepressant (Brown, 2021). Another

possible influence may be the presence of potassium. Some research links potassium to a reduction in anxiety (Brown, 2021).

Dark, leafy vegetables: Vegetables like kale, spinach, broccoli, lettuce, asparagus, beetroot, savoy cabbage, green peas, fresh parsley, and cauliflower are part of a healthy diet loaded with vitamins and minerals like folate, vitamin C, B₃, B₆, magnesium, and zinc, and are critical to physical and mental functions (Kaplan et al., 2007). Antioxidants such as vitamin C and carotenoids play a pivotal role in protecting the body against oxidative stress, which is responsible for the causation and progression of neurodegenerative diseases, atherosclerosis, some cancers, and some forms of depression (Irshad & Chaudhuri, 2002).

Nuts and legumes: Foods like walnuts, almonds, beans, and lentils are staples of healthy eating. They are loaded with micronutrients such as folate, zinc and magnesium, healthy fats, protein, and fibre, which are linked to the reduction of anxiety and depression. The production of neurotransmitters requires nutrients (amino acids, minerals and B vitamins) found in the above-mentioned foods (Elena-teodora & Sandra, 2020).

Healthy fats: These refer to polyunsaturated fatty acids which have a positive linear relationship to high-density lipoprotein when synthesized in the liver. The main sources of such fats include oily fish, avocado and extra virgin olive oil among others and are a major part of the Mediterranean diet.

The presence of polyunsaturated fatty acids confers cardio-protective benefits to the diet (Owen et al., 2000). These high PUFA fats also contain phenolic compounds which have antioxidant and anti-inflammatory properties that could help prevent symptoms of depression and elevate the mood. Dysregulated lipid metabolism and low dietary consumption of n-3 PUFAs have been implicated in neuropsychiatric diseases, encompassing specific domains including development (Milte et al., 2011; Veena et al., 2010); mood (Lin et al., 2010; Riemer et al., 2010); psychosis (Amminger et al., 2011; Evans et al., 2003); suicidal behaviours (Sublett et al., 2006), and neuro-inflammation (Kiecolt-Glaser et al., 2007; Calder, 2006).

Fermented foods: Fermentation is an ancient practice that continues to the present day. Its application in food processing is a means to provide palatability, nutritional value, preservative, and medicinal properties. In recent years, researchers have discovered many ways in which consuming fermented products affect our intestinal microbiota. For example, fermentation-enriched bioactive peptides derived from fermented products such as yoghurt, sauerkraut, and pickles may have anti-inflammatory effects, improve glycemic control antioxidants and reduce high blood pressure (Selhub et al., 2014). Fermented foods also have a beneficial effect on endotoxins called lipopolysaccharide, large molecules that are found to be particularly important in depression. The nutrients from fermented foods also could lead to improved neurotransmitter and neuropeptide production in the brain thereby improving moods and mental

well-being (Selhub et al., 2014). Controlled fermentation may often amplify the specific nutrient and phytochemical content of foods, the ultimate value of which may be associated with mental health. Microbes (for example, *Lactobacillus* and *Bifidobacteria* species) associated with fermented foods may also influence brain health (Selhub et al., 2014).

Foods that could cause poor mental health

Ultra-processed foods: Ultra-processed foods are formulations of several ingredients that, besides salt, sugar, oils and fats, include food substances not used in culinary preparations, in particular, flavours, colours, sweeteners, emulsifiers, and other additives used to imitate sensorial qualities of unprocessed or minimally processed foods and their culinary preparations or to disguise undesirable qualities of the final product (Costa et al., 2015). The ultra-processing of foods depletes their nutritional value and also increases the number of calories as ultra-processed foods tend to be high in added sugar, saturated fats and salt, while low in protein, fibre, minerals vitamins and phytochemicals (Hecht et al., 2022). Poor dietary quality is well-established as a potentially modifiable risk factor for mental disorders (Marx et al., 2017; Marx et al., 2021). A meta-analysis of prospective studies has demonstrated that greater ultra-processed food intake was associated with an increased risk of subsequent depression (Lame et al., 2022)

Results of a meta-analysis study conducted by Hafizurrachman et al. (2021) also indicated a significant positive association between the

frequency of junk food consumption and symptoms of mental health problems. Polat et al. (2014) revealed that frequent junk food consumption leads to an increase in testosterone and estrogen production, which might cause specific problems, including stress triggers. In a study of children and adolescents, consuming fast food, sugar and soft drinks was associated with a higher prevalence of diagnosed attention deficit/hyperactivity disorder (Ríos-Hernández et al., 2017).

In addition to physical health risks, diets with a high glycaemic index and load (e.g. diets containing high amounts of refined carbohydrates and sugars) may have a detrimental effect on psychological well-being by increasing the risk of depression and anxiety. High dietary glycaemic load, and the resultant compensatory responses, could lower plasma glucose to concentrations that trigger the secretion of autonomic counter-regulatory hormones such as cortisol, adrenaline, growth hormone, and glucagon (Ludwig, 2020; Seaquist et al., 2013). Findings showed that such counter-regulatory hormones may cause changes in anxiety, irritability, and hunger (Towler et al., 1993). Consumption of high-sugar, low fibre and high-fat diets has also been linked to the incidence of obesity. Mounting evidence reveals that the psychiatric consequences of obesity stem from poor diet, inactivity, and visceral adipose accumulation. Resulting in metabolic and vascular dysfunction, including inflammation, insulin and leptin resistance, and hypertension, which have emerged as key risks to depression and anxiety development (Milaneschi et al., 2019; Zhao et al., 2011).

Caffeine: Caffeine is the most commonly consumed central nervous system stimulant worldwide (Evans et al., 2020). It is most often consumed orally and absorbed in the gastrointestinal tract. It quickly reaches the brain because of its ability to pass through the blood-brain barrier, but it is equally distributed through the body's total water and stays in similar concentration throughout the body (Maisto et al., 2011). Caffeine has "mental activating" properties, increasing alertness and energy and reducing sleepiness and fatigue (Fredholm et al., 1999; Smith, 2002). These effects contribute to increased performance in some contexts, being particularly apparent in situations of low alertness, such as early morning sleep deprivation, and when sustained performance is demanded. In addition, increased dopaminergic activity induced by caffeine can have positive effects on mood, cognition, effort-related behaviour, and executive functions, but this effect may, on the other hand, promote mania (or mood instability) and psychosis (Lara, 2010).

Behaviour and mood symptoms linked to psychiatric disorders have also been associated with caffeine consumption. Caffeine inhibits adenosine receptors in the central nervous system, mainly in the hippocampus, amygdala, and prefrontal cortex (locations with high concentrations of these receptors that are associated with emotion, cognition, and motivation), which might play a role in the association between depression and caffeine consumption (Cappelletti et al., 2015; Iranpour et al., 2018; López-Cruz et al., 2018).

Additionally, accruing a sleep debt of two hours or more has been linked to increased melancholic symptoms, and depression was considered to be an affective symptom of sleep debt (Regestein et al., 2010).

Alcohol: Alcohol also has been associated with basically all mental disorders (Kessler et al., 1997), although the causality of these associations is not clear. Thus, mental disorders may be caused by alcohol use disorders (AUDs) or alcohol use. AUDs may be caused by other mental disorders, or third variables may be causing both AUDs and other mental disorders (Rehm, 2011). People often think of alcohol as a mood elevator, but it's a depressant. More so, alcohol increases anxiety symptoms the morning after drinking, particularly after overindulging (North West Primary Care, 2022). In addition, alcohol reduces the quality of sleep, which could induce or worsen stress and other forms of psychological distress.

The roles of Food Scientists in mental health improvement

Food Science is a multidisciplinary field that deals with the application of basic science and engineering to study the fundamental, physical, chemical and biochemical nature of foods and the principles of food processing. It is also concerned with the use of information generated by the science of food, in the selection, preservation, processing, packaging and distribution as it affects the consumption of safe, nutritious, wholesome foods (Okaka, 2010).

Based on the established association between food and MH, Food Scientists have significant roles to play in mental

health improvement since they are involved in every step in the food supply chain; from farm to fork. Activities of Food Scientists could either improve or decrease critical nutrients and phytochemicals that boost mental health or cause high amounts of detrimental nutrients thereby ultimately affecting mental health. Food Scientists should therefore incorporate those handling, processing and preservation methods and ingredients that improve mental health during food processing while at the same time reducing those that negatively affect mental health. The strategies that could be employed to achieve these include:

Proper handling and storage of foods

Once food has been harvested, gathered or slaughtered, enzymes and bacteria become active in this food which causes it to deteriorate in texture and composition until it eventually becomes unfit for consumption. Fruits and vegetables continue to respire after harvest. During this process, they inhale oxygen and give out carbon dioxide as if they are living entities. This action leads to the breaking of the stored organic materials into simple end products. In this process, energy is released in the form of heat. The loss of stored food reserves during respiration means hastening the senescence, reduced food value, loss of flavour, a quality particularly sweetness and loss of salable dry weight (Kader, 2002).

Handling starts immediately after harvest to conserve quality and nutrients. Postharvest handling is the stage of crop production immediately following harvest, including cooling, cleaning, sorting and packing. The moment a crop is removed from the

ground or separated from its parent plant, it begins to deteriorate. The most important goals of postharvest handling are keeping the product cool, avoiding moisture loss and slowing down undesirable chemical changes, and avoiding physical damage such as bruising, to delay spoilage (Pokhrel, 2020). A poor-quality raw material will ultimately produce a poor quality finished product. Good post-harvest practices have a strong correlation with certain nutrients and phytochemicals in fruits and vegetables. It has been reported that all treatments that delay fruit ripening, maintain fruit quality and increase fruit life also increase antioxidant capacity, ascorbic acid, phenolics, tannins and flavonoids contents and decrease compounds associated with fruit colour such as anthocyanins, carotenoids and lycopene (Galal, 2022). Hanafy-Ahmed et al. (2008) also reported that lower temperatures maintained vitamin C content, while it decreased with increasing storage temperature. Food Scientists have the responsibility of conserving the quality of foods from harvest to the final consumers; they should therefore ensure that proper handling and storage methods are employed throughout the food supply chain.

Use of minimal processing techniques

Minimal processing involves the use of mild technologies that cause negligible influence on the quality attributes of foods during their storage or shelf life. It is a technique which allows the least physicochemical, oxidative and mechanical damage to the food products (Bansal et al., 2015). The aims of minimal processing include: (i) to

make the food safe chemically and microbiologically, (ii) to retain the desired flavour, colour and texture of the food products, and (iii) to provide convenience to the consumers (Allende et al., 2006).

Fruits and vegetables are prone to microbial spoilage since these are composed of enzymes, pectin and near acidic pH, and high water activity (González-Aguilar et al., 2010). Minimal processing applied to maintain their shelf life are grading, sorting, washing, peeling, chopping and shredding. It is important to avoid harsh washing and use disinfectants during washing. This inhibits the activities of the enzymes present in fruits and vegetables such as polyphenol oxidase, polygalacturonase, and lipooxygenase. These enzymes play an essential role in initiating the oxidation process and are also responsible for spoilage in the cases of cut surfaces for diced or sliced fruits and vegetables (Vasudha et al., 2015).

For animal foods, non-thermal processing, such as high hydrostatic pressure, pulsed electric fields (PEF), oscillating magnetic fields, use of irradiation, and use of natural antimicrobials should be applied to animal-based food products (i.e. tender meat, fish, and seafoods). These treatments can help maintain the texture, flavour and taste of the foods and at the same time reduce nutrient loss.

Another strategy for achieving minimal processing is the use of hurdle technology. Hurdle technology usually works by combining more than one processing approach as opposed to the use of one approach which may prove to be too severe on the nutrients. Such approaches can be thought of as

"hurdles". The right combination of "hurdles" can ensure that all pathogens are eliminated or rendered harmless in the final products (Tavman et al., 2014) as well as achieving considerable nutrient conservation. Hurdle technology acts by exhausting bacterial cells as each hurdle that is applied requires the cells to use energy to maintain their internal pH, and osmotic pressure and keep toxic molecules out. (Brendan et al., 2011). Asogwa et al. (2018) employed the hurdle technology to extend the shelf life of soymilk by the combination of blanching, steaming, and use of natural and chemical preservatives.

Use of frying techniques that reduce oil uptake

Deep-fat frying is one of the conventional and most common operations in the preparation of a variety of fried foods, which is used worldwide to create desirable flavours and textures in foods (Bouchon et al., 2003; Zamani-Ghalehshahi & Farzaneh 2021). The advantageous sensory characteristics of most deep-fried foods derive from the formation of a composite structure that provides a crispy, porous, oily outer layer and a moist, cooked interior (Liu et al., 2020; Moreira, 2007). When food absorbs fat, it can change the composition, texture, size, and shape of the food, resulting in a loss of nutrients, specifically vitamins (Marciniak-Lukasiak et al., 2019).

There is growing interest in methods that could minimize oil uptake and reduce the fat content of fried foods. This is because the consumption of high-fat foods has been linked to obesity and other health challenges. An elevated Body Mass Index (BMI) is

predictive of a chronic course of depressive and anxiety symptoms (Garipey et al., 2010). A similar positive relationship between obesity and heightened odds of an anxiety disorder or anxiety symptoms (e.g., dread, unease) by 30% and 40%, respectively has been reported (Opel et al., 2021; Rapuano, 2020). Studies have shown that eating a diet high in saturated fats might make depression more likely. To this end, rodent research has revealed that a prolonged high-fat diet elicits metabolic dysfunction and increases anxiety and depressive-like behaviours (Sivanathan, *et al.*, 2015).

Frying methods that help to reduce oil uptake include:

a. Vacuum frying: Vacuum frying is a deep-frying process, which is carried out in a closed system, under pressures well below the atmospheric pressure levels preferably lower than 7000 Pa, thereby making it possible to reduce the boiling point of water substantially, and consequently, the frying temperature. The low temperatures employed and minimal exposure to oxygen in the vacuum frying process account for most of its benefits, which include nutrient preservation (Da Silva and Moreira, 2008), oil quality protection (Shyu *et al.*, 2005) and reduction of toxic compound generation (Granda *et al.*, 2004). It is an effective method to produce snacks with low oil content and a characteristic texture and flavour.

b. Air frying: Air frying is a new technique to get fried products through direct contact between an external emulsion of oil droplets in hot air and the product in a frying chamber. The product is constantly in motion to promote homogeneous contact between

both phases. In this way, the product is dehydrated and the typical crust of fried products gradually appears. The amount of oil used is significantly lower than in deep oil frying giving, as a result, very low-fat products. In a study to compare the oil content of chin-chin a local snack food, Okoye et al. (2021) reported a fat content of 15.03% and 41.47 % for air-fried and deep-fried samples respectively.

c. Food coating: Edible coatings are currently used as viable alternatives for frying since these substances adhere to the product and form an external barrier that prevents the absorption of fat during immersion frying processes (Jiang *et al.*, 2021). Asogwa et al. (2020) used gum extracted from *Prosopis africana* (okpeye) seed coat waste to coat plantain chips before frying, they reported a significant decrease in oil uptake as gum concentration increased.

d. Inter-esterification: The inter-esterification process rearranges the distribution of the fatty acids in oils either chemically or enzymatically within and between the triglycerides. This process brings about alteration in the distribution of fatty acids with the fat without changing their composition. One current application of this process is in the production of trans-free or low-trans fats spreads, margarine, and shortening. Several human studies have shown no significant effects of inter-esterified fats on blood lipid parameters (Hunter, 2001).

Fortification and Enrichment of Processed Foods

As already highlighted earlier many of the micronutrients like foliate, and the B vitamins have been linked to improved mental health. Heseke et al.

(1990) reported that low vitamin B₁, ascorbic acid and folate status was associated with poor mood. Thiamine supplementation significantly improved Hamilton Anxiety Rating Scale, increased both appetite and general well-being, and reduced fatigue in patients with generalized anxiety disorder. Food scientists must therefore ensure that processed foods contain critical micronutrients and that those lost in the course of food processing are replaced or even boosted.

Food fortification is defined as the process of adding critical vitamins and minerals to commonly consumed foods during processing to improve their nutritional value (Olson et al., 2021). It is an important strategy for the prevention and control of micronutrient deficiencies. It is a safe and cost-effective strategy. Food enrichment on the other hand is a practice of replacing nutrients lost during food processing. Food processing techniques such as enrichment and fortification can boost the levels of essential nutrients in foods. Some examples are the fortification of margarine and vegetable oils with vitamin A, iodization of salt, iron-fortified infant cereals, fortification of milk with vitamin D, fortification of wheat flour with folic acid and enrichment of cereals with B vitamins. Even though these strategies are used to prevent or control micronutrient deficiencies, the improved nutritional status of those foods could also improve mental health. A strategy to fortify foods with micronutrients associated with mental health such as foliate, selenium etc., should also be advocated by Food Scientists.

Conclusion

This paper has highlighted the relationship between food and mental health. It has been observed that an individual's diet goes a long way to determine his or her mental health. Among all the known diets eaten globally, the Mediterranean diet has been confirmed as the best diet for mental health promotion and protection. Food Scientists play crucial roles in the food and mental health nexus as they are involved in the farm-to-fork continuum comprising all stages of the food supply chain. The roles of Food Scientists involve employing techniques that conserve and improve critical nutrients and phytochemicals. Such techniques include proper handling and storage of foods throughout the food supply chain; minimal processing techniques, and techniques that reduce the oil content of fried foods. Other strategies include the use of the interesterification method in fat modification, food fortification, supplementation and enrichment.

Recommendations

Having established the crucial role of foods and food scientists in mental health improvement, it is recommended that;

1. Food Scientists should accelerate research targeted at the nutritional profiling of local foods and the effects of food processing on the nutrients.
2. They should also speed up efforts on establishing a link between food (especially local foods) and mental health.
3. Food Scientists should also build linkages with relevant stakeholders such as food industries, food vendors, governmental and non-governmental

agencies, food regulatory bodies etc to facilitate the transmission of research findings to the community.

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Microbial Spoilage of Fruit and Vegetables: Implications for Human Health

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Abstract

The majority of harvested farm produce is spoiled before consumption. About one-fourth of all farm produce is spoiled before it is available for consumption. Microbial spoilage of fruits and vegetables usually occurs during storage, transportation and during waiting for processing. It is observed that fruits and vegetables after picking and before processing are alive and can respire. The resulting respiration of the products and the normal ripening process affect the microbiological spoilage of fruits and vegetables. Microbiological spoilage of fruits and vegetables may occur in stages or forms. Knowledge of microbial invasion at these stages may help prevent bacterial contamination and product spoilage. If families become aware of the spoilage pathway of these farm products it will help to prevent consumers from getting contaminated. Generally, microorganisms on fruits and vegetables include normal flora, microorganisms from soil and water, some moulds and yeast. The deterioration of raw vegetables and fruits may result from physical factors, the action of their enzymes, and microbial action. Some of the foodborne pathogens found in contaminated fruits and vegetables are *Salmonella*, *Campylobacter* and enterohaemorrhagic *Escherichia coli*. These pathogens are responsible for most common ailments that affect millions of people annually, sometimes with severe and fatal outcomes, symptoms of which can be fever, headache, nausea, vomiting, abdominal pain and diarrhoea.

Keywords: Microbial spoilage; vegetables; fruits; health implications.

Introduction

Fruits can be referred to as structures that develop from a fertilized ovary of a flower. As the ovules become seeds, the ovary enlarges to contain them. This enlarged structure is called the fruit. Ovaries from a fertilized flower form what are called true fruits whereas ovaries arising from other structures such as calyx are called false fruits. There

are different types of fruits because of the variation in the types of ovaries. Fruits can be separated into three major categories: simple fruits, aggregate fruits, and multiple fruits (Sukhetha, Hamilatha & Raji, 2021). Simple fruits like oranges are formed from a single ovary which may or may not consist of multiple parts, while aggregate and multiple fruits are formed from several

ovaries together. Aggregate fruits like raspberries are the ripened ovaries of one flower that form a single fruit, and multiple fruits like pineapples are formed from the ovaries of separate flowers that are close together.

The main function of fruits is to produce seeds and to offer some protection to the seed. According to Slavin and Lloyd (2012), fruits may be fresh or dried. Examples of fresh fruits are mango and coconut fruits. The mango and coconut fruit are referred to as drupes, while pawpaw and tomato fruit are known as berries. Examples of dried fruits are the legumes generally such as beans, okra, and *Crotollaria retusa* among others. Vegetables may include all the other floral parts except the fruits, this includes the leaves and other floral parts even the stems. Nutritionally, fresh farm produce is recognized as an important source of nutrients, vitamins and fibre for humans. They play a vital role in human nutrition by supplying some necessary nutritional substances to the human daily diet that can help to maintain keep good health. They provide vital ingredients in healthy and balanced diets in the right proportion for human growth and development, when they are not spoiled (Slavin & Lloyd, 2012)

The following factors can make fruits and vegetables susceptible to spoilage, including mechanical damage resulting from the action of animals, birds or insects, or bruising, wounding, bursting, cutting or other mishandling. Previous damage by plant pathogens may also open a way for the growth of saprophytes (Oluwadara et al., 2021). Contact with spoiling fruits and vegetables may bring about the transfer of pathogens, causing spoilage and

increased wastage. Improper environmental conditions during harvesting, transit, storage and marketing and the action of their enzymes may favour spoilage (Soliva-Fortuny & Martin-Belloso 2003). Susceptibility of fruits and vegetables is largely due to differential chemical components such as pH value and moisture content which greatly predispose these products to microbial spoilage.

Fruits and vegetables can be spoiled by pathogenic and non-pathogenic means. When fruits and vegetables are spoiled by pathogenic organisms, such as bacteria and fungi, this deterioration is called microbial spoilage, which is spoilage due to the activity of microbes. There are different types of microbial spoilage as a result of the organism involved (Samson et al., 2002). The most common types of spoilage are bacteria soft rot, grey mould rot, rhizopus soft rot, blue mould rot, black mould rot, downy mildew and watery soft rot. Many factors affect the spoilage of fruits and vegetables, among these is the composition of the fruit and vegetable which influences the type of spoilage, for example, bacteria soft rot is widespread among less acidic vegetables. Fungi are the most post-harvest spoilage organisms of fruits and vegetables. Fungal rots of different kinds grow on fruits and vegetables. They attack the fruit at all stages taking advantage of any crack or bruising (Paull & Chen, 2002).

Microorganisms that contaminate fruits and vegetables

The inner tissues of healthy plants and fruits are free from microorganisms, however, the surfaces of raw vegetables and fruits are contaminated with a

variety of microorganisms and this depends on the microbial population of the environment from which the food was taken, the condition of the raw product, the method of handling, the time and conditions of storage (Beuchat, 1999).

Microbial contamination can occur during any of the production stages; in the farm, during harvest, processing, wholesale storage, transportation or retailing and handling in the home, and this contamination can arise from environmental, animal or human sources, (Jacobi *et al.*, 2001). The microorganisms on the surfaces of freshly harvested fruit and vegetable include normal surface flora, those from the soil and water and some plant pathogens, others include moulds and yeast. Generally, the pathogens that are involved in the contamination of fruits and vegetables include bacteria, fungi (moulds and yeast), viruses and some protozoa (Samson & Filternberg, 2002).

Health Implications of eating contaminated fruit and vegetables.

Since most fresh produce receives minimal processing and is often eaten raw, pathogenic contamination can represent a serious health risk. Further cutting, slicing or peeling causes tissue damage which releases nutrients and facilitates the growth of microorganisms (Laura & Keith, *et al.*, 2011).

Fresh produce remains the leading cause of foodborne illness outbreaks, implicating virulent pathogens such as Shiga toxin-producing *Escherichia coli*

(STEC), *Salmonella*, *Listeria monocytogenes* and human parasites (Ukuku & Saper, 2001). The open nature of the fresh produce production chain means that contamination can be introduced at various points in production; this makes them harbour a wide range of microorganisms including plant and human pathogens.

Fresh vegetables are a good source of various components of food that enhance healthy living, but evidence shows that they promote the growth of microbes which also deteriorate the food and subsequently causes adverse effect on the health of consumers (Soliva-Fortuny & Martin-Belloso, 2003).

Prevention of microbial contamination of fruits and vegetables

To reduce the risk of pathogen contamination, the FDA, 2008 released a guide to minimizing microbial food safety hazards for fresh fruits and vegetables which underlined the major reservoirs of pathogens contamination and methods required for their control (USFDA, 2008; USDH, 2011). Some of the specifications of these guidelines is Personnel cleanliness: the recommendations address two major areas: worker health and hygiene and training. FDA recommends that employees wash their hands before beginning work and after engaging in any activity that may contaminate their hands.

Training on sanitation principles and sanitary practices: FDA recommends that employees with cleaning and sanitation duties be trained to understand the principles and methods required for effective cleaning and sanitation, especially as

those methods relate to food safety. They recommend that supervisors be trained to identify and promote good sanitary practices. FDA also recommends that employees be trained in the proper use of sanitizing agents.

Building and equipment: FDA recommends that the processing facility and its structures (such as walls, ceilings, floors, windows, doors, vents, and drains) be designed to be easy to clean and maintain and to protect the product from microbial, physical, and chemical contamination.

Environmental monitoring: FDA recommends an environmental monitoring program designed to detect areas of pathogen harborage and to verify the effectiveness of cleaning and sanitizing programs in preventing cross-contamination.

Transportation and storage: FDA recommends that finished fresh-cut products be stored and transported under conditions that will protect the food against physical, chemical, and microbiological contamination. They recommend, if feasible, that raw whole products not be stored with the finished product and that the finished product be transported in clean, sanitary vehicles (FDA, 2008; USDH, 2011).

Another effective means of control is to apply post-harvest decontamination interventions that can replace or supplement post-harvest washing. To this end, research to enhance the microbiological safety of fresh produce has started to identify and develop alternative intervention methods such as refrigeration, heat treatment, modified atmosphere packaging (MAP), and 1-methyl cyclopropane (1-MCP) and calcium chloride (CaCl₂) application was also vital (Fallik et al., 2001).

Washing with detergents and germicidal solutions will reduce the number of microorganisms on fruits and vegetables (Changjin et al., 2014; Fallik et al., 2001). Aseptic handling of utensils and equipment used in carrying the fruits and vegetables could help reduce the number of microbes on the products. The containers should be properly washed and sanitized from time to time; the processing equipment should also be sanitized and properly washed (Sapers & Sites 2003).

Conclusion

Fruits and vegetables are widely consumed all over the world both in raw and processed forms. They are indispensable sources of vitamins and minerals in addition to other health-promoting nutrients. However, they are subject to attack by some species of bacteria, fungi and protozoa and plants' enzymes. Various factors predispose fruits and vegetables to microbial contamination, such as the action of animals, birds or insects, bruising, wounding, bursting cutting or other forms of mishandling. Consumption of contaminated fruits and vegetable products has serious health implications for humans and could lead to mortality. Sanitary measures should therefore be taken to minimize microbial infestation of fruits and vegetables at personal, industrial and distribution levels.

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